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Swine

By

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PART I.

THE PLACE OF THE HOG UPON THE FARM

The swine industry occupies a rather peculiar position in many localities. Swine multiply rapidly and come into use for breeding at an earlier age than other farm animals; consequently, it takes only a short time for farmers to increase or decrease their stock, as the case may be.

Fluctuations in Hog Supply.—When, owing to scarcity in the supply of hogs, the price for hogs goes up, we find farmers increasing the number of breeding sows, and in a very short time the supply of hogs coming to market increases to such an extent that the price is likely to break. If the decrease in price is very severe, the farmer becomes disgusted, and the chances are that many farmers will sell their breeding sows and practically go out of the business. This unloading process adds to the burden of the market, and general demoralization is apt to follow. By and by, after the market has absorbed the excessive supplies thrown upon it, a scarcity occurs again, owing to so many having gone out of the business of hog raising, and prices once more reach a high level. This is a signal for farmers to rush again into hog raising, and overstock their farms in many cases, so that once more the market becomes top-heavy, and the history of the hog market repeats itself.

Now, it is altogether probable that very few of those who were tempted to rush into the business on account of high prices obtained any profit from the venture. They paid high prices for breeding stock, but by the time they had hogs ready for the market the decline in prices began, and before they were through they were selling their hogs at a loss.

Profit from Hogs.—The man who makes money out of hogs is the man who has hogs to sell when prices are high, whose farm is never over-stocked, nor yet entirely depleted of its supply. He knows how many hogs his farm will carry to advantage under average circumstances, and he practises a wise conservatism. When prices are high, he has a good profit, when they are low, his profit is small, but the average is fairly satisfactory. He may slightly expand or contract his operation at various times, but he never "plunges."

The "plunger" is apt to find himself "in" when he ought to be "out," and "out" when he ought to be "in." The other man is "in" at all times, but never to such an extent as to be seriously damaged when the market goes wrong.

It is not the object of the writer to urge farmers to feed more hogs—far from it. Every farmer must be his own judge in this matter, and many farmers should never attempt to raise hogs, owing to the fact that either the man himself is not adapted to the business or his conditions are unsuitable. Nevertheless, it is true that a few hogs might be kept profitably upon many farms where they do not find a place to-day.

Hogs a By-Product.—Generally speaking, the hog may be regarded as a by-product of the farm, or, in other words, he is a means of marketing the by-products of the farm. In the cattle feed lots, we find him utilizing the corn which the cattle have failed to digest and which otherwise would be wasted. In the dairy district, he is the means of obtaining good value for skim milk, buttermilk, and whey. Where mixed farming is practised, he consumes any dairy by-products, small potatoes, and various other unmarketable substances, and gleans the stubble fields, returning to his owner cash value for substances that are completely neglected on many farms. Even the cottager frequently utilizes him to obtain a cash return from kitchen refuse and table scraps. It is as a consumer of by-products and so-called worthless materials that the hog shows to the best advantage from the standpoint of profit.

Advantages of Home-grown Feeds.—The farmer who raises most of his own feed is in a much better position to feed hogs, or any other class of stock, than the man who has to purchase all his feed. The farmer who grows his own feed may not get any more than market prices for the grain or other produce consumed by the hogs, and may still have a fair profit through selling his produce at market prices in the form of pork; but the man who buys his feed can have for profit only what he obtains in excess of the market value of the feeds consumed by the hogs. Thus the farmer who grows his feed has two sources of profit, namely, the grower's profit, or the profit obtained by selling his produce at market price; together with the feeder's profit, or what he obtains for his produce in excess of market price by selling it in the form of pork. The man who has to buy all the produce which he feeds his hogs can have only the feeder's profit, and under unfavorable conditions this profit may be so small that it will scarcely pay for the labor involved.

Raising Pigs.—Another point worthy of consideration is the fact that under favorable conditions and skilful management, young pigs can be raised for feeding at a lower cost than that for which they can be bought. This point will be dealt with more fully in another place but is mentioned here as one of the factors which help to explain why some people can make hog feeding profitable while others cannot.

Judgment Needed.—One of the great difficulties in connection with the swine industry is the fact that so many people are not content to engage in the undertaking except on a large scale, and the people who can handle hogs in large numbers and make the business a financial success are comparatively few. The average farmer is safer to handle hogs in rather small numbers, and use them as an adjunct to his other farm operations. Used in this way, and handled with a reasonable degree of judgment, the hog will give a good account of himself in adding to the revenue and the profits from the farm. A very few years' experience should enable a farmer to determine just about how many hogs he can raise to advantage. Some farms will carry very large numbers owing to the system of farming which is carried on, but for many of the smaller farms one breeding sow is plenty.

Hogs and Dairying.—The hog fits in especially well upon dairy farms where skim-milk, buttermilk, or whey has to be fed upon the farm. Perhaps no animal will give as high returns for dairy by-products consumed as the hog, and no feed gives a finer quality of bacon than dairy by-products. It is also worthy of note that the man who has skim-milk is in a better position to raise pigs than the man who has none, for the reason that it is difficult to find a satisfactory substitute for skim-milk for young pigs just after weaning.

Pure-bred Hogs.—What has been said in the preceding paragraphs has no reference to the raising of pure-bred hogs for breeding purposes, but applies simply to the production of market hogs. The breeders of pure-bred hogs understand their business, and know about how far their conditions warrant the extension of their operations, so that it is not so necessary to offer suggestions to them along this line. It is true that the breeder of market hogs always has a use for pure blood, but it is not every person who can make a success of breeding pure-breds to supply the demand for breeding stock, and the average farmer is safer to adhere to producing market hogs.

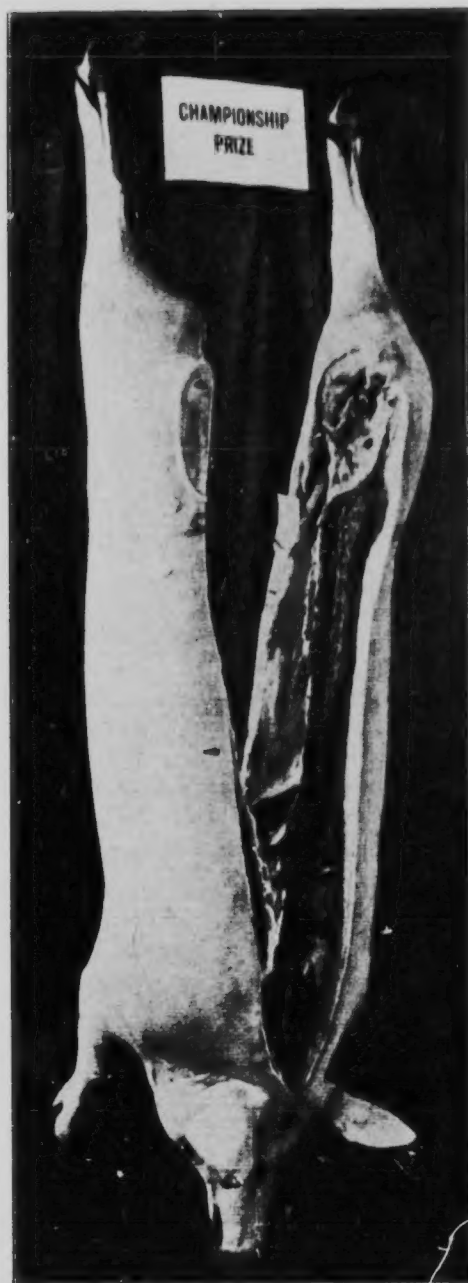
Summary.—To sum up, it may be said that the hog is especially valuable for consuming the by-products of the farm, and the number of hogs carried to advantage upon a farm is governed very largely by the quantity and character of the by-products to be consumed. When carried in appropriate numbers, the hog is an exceptionally economical producer of meat, preventing waste, and giving cash returns for substances that are frequently wasted, or which have little market value. Trying to take advantage of fluctuating market prices by alternately overstocking and understocking with hogs is seldom a financial success. The man who consistently follows up the business upon conservative lines is the man who is well satisfied with the hog as a source of profit.

PART II. TYPES OF SWINE

There are two well-defined types of hogs, which are the outcome of local conditions and market requirements,—namely, the fat or lard type and the bacon type.

Reasons for Two Types.—The fat or lard type of hog is the product of the "corn belt." Corn feeding has a tendency to produce fat at the expense of muscle or lean meat, and corn is the principal hog feed of the United States. Most of the hogs of the United States are grown in the great corn-producing States, and it is here we find the lard type in its highest degree of perfection. This type plays an important part in the exports of the country.

But, in addition to the demand for the products of the lard hog, there is an important demand, both at home and abroad, for a leaner class of meat. In some of the large cities of England this demand has taken a definite form, and what is known as the "Wiltshire side" is especially designed to meet this demand. A hog suitable for manufacturing into "Wiltshire sides" is known as a "bacon hog," and breeding stock of a type suitable for producing bacon hogs is said to possess the lean type. Bacon hogs cannot be produced successfully under a system of corn feeding, and hence we find the bacon hog produced in greater numbers in countries where the feed for the hog is more varied in character, and where the conditions are less favorable for producing the lard hog than they are in the United



Champion bacon carcass, Provincial Winter Fair, Guelph.

states. The countries sending the greatest number of Wiltshire sides to Great Britain are Denmark, Canada, and Ireland. Generally speaking, hogs cannot be grown so cheaply in Canada and Denmark as they can in the United States, particularly in the corn belt; but, on the other hand, Wiltshire sides usually command a higher price per pound in England than the meat of the lard hog. This higher price for finished product affords some protection to the swine industry in Canada and Denmark, and it was to escape direct competition with the American product in Great Britain that Canada and Denmark engaged in the production of bacon hogs and the manufacture of Wiltshire sides. Such an arrangement seems to be the part of wisdom, each country devoting its attention to the type of hog which it can produce to best advantage.

THE BACON TYPE.

To produce a good Wiltshire side of bacon requires a hog of certain definite peculiarities as to weight, condition, and conformation. The customers for this

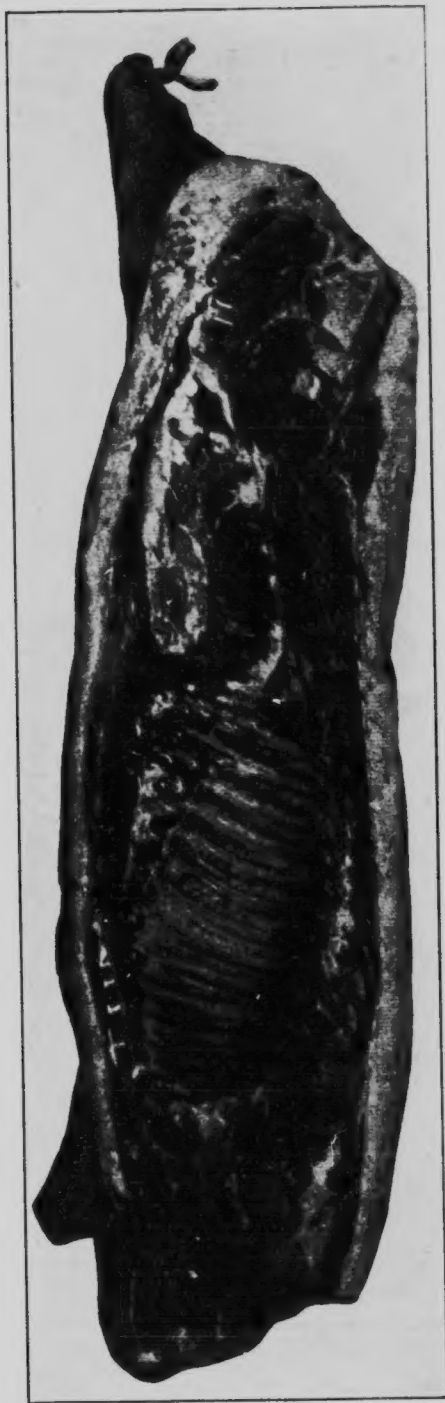


Fig. 1.—Pair of export bacon hogs.

class of bacon are extremely fastidious, and, if the bacon does not come up to the standard in every particular, it is very heavily discounted in price. As a rule, the weight limits are usually fixed at 160 pounds to 200 pounds live weight. It is true that a hog may weigh slightly more than 200 pounds and still make a very good Wiltshire side, but most hogs are inclined to be too fat after they pass the 200-pound mark, and consequently this is fixed as the limit, though it is not strictly adhered to. As to condition, it is possible to have the hog too thin or too fat. When the carcass is split down the back, the layer of fat along the back should be from an inch to an inch and a quarter in thickness, and should be as uniform in thickness as possible from the loin to the neck. The most valuable meat in a Wiltshire side is the upper part of the side from the ham to the back of the shoulder, including the upper corner of the gammon or ham, the loin, and the upper half of the ribs. The lower part of ham and the flank and belly meat are



An ideal Wiltshire side of bacon, showing how the side is trimmed and the shape in which it is placed upon the British market.



A side of bacon which is too short and decidedly too fat
for a Wiltshire side.

not worth as much per pound as the upper portions, and the shoulder and neck are comparatively cheap parts.

Conformation.—In form, the bacon type of hog is very different from the lard type. It is longer in the leg and body, has less thickness and depth of body, and is lighter in the shoulder, neck, and jowl. The hog should be long from the back of the shoulder to the ham, but comparatively short from the back of the shoulder to the snout. Along with the length, however, the hog must have sufficient depth and thickness to denote constitution. No matter how long in body it may be, if it has long, coarse legs, and a narrow, cramped chest, it is an undesirable type to breed from. A trim belly is desirable, because the belly meat is cheaper than the upper part of the side. In judging sows that have produced several litters of pigs, some allowance must be made in this connection.

A fine, smooth *coat of hair* denotes thriftiness and good quality of flesh. Wrinkles on the skin, if at all marked, indicate coarse-grained flesh. Softness or

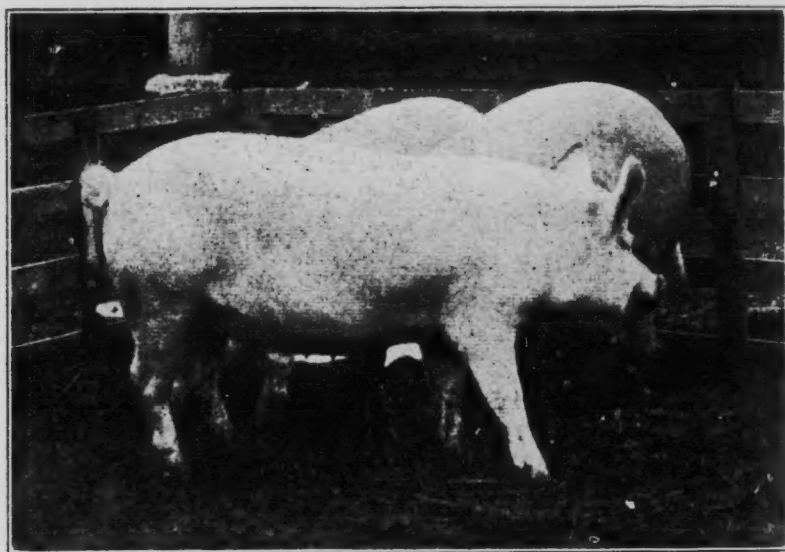


Fig. 2.—Bacon type. Note light jowl, neck and shoulder.

flabbiness of flesh denotes too much fat in proportion to lean. There is a marked difference between the handling qualities of a finished bacon hog and a finished lard hog, the former being much firmer to the touch. The bacon type of hog has heavier bone than the fat or lard type, but very coarse, puffy looking bone denotes poor quality of flesh and is often associated with poor feeding qualities. Though the bone is fairly heavy, the legs should present a clean-cut appearance.

The *jowl* has very little market value. A heavy jowl denotes tendency to put on too much fat. Good width of jowl is desirable from a feeder's standpoint, but it should be very trim and neat.

A long, scrawny *neck* indicates weak constitution and slow feeding qualities. On the other hand, a short, thick neck with an arch, or crest of fat on top, such as is commended in the fat hog, will cause the side of bacon to be heavy at the shoulder and neck end and this is the cheap end of a side of bacon. The neck should be of only medium length, and should possess no tendency to arch on top.

The *shoulder* of the bacon hog is somewhat upright, making the animal comparatively short from the back of the shoulder to the snout, but long from the back of the shoulder to the rump. The shoulder is a cheap part, and, therefore, should be rather light. It should be very compact over the top, should be no wider than the back, and should blend smoothly into the body at all points.

The *back* carries the most valuable meat, but it should not be wide, because a wide back invariably carries too much fat for a Wiltshire side. It should possess medium width, and should carry its width evenly throughout. The top line should be slightly arched, the highest point being over the loin.

The *loin* is the most valuable cut in a Wiltshire side, and should be as wide as the rest of the back, full, strong, and well packed with flesh.

The *spring of rib* of a bacon hog is very characteristic. It should spring out boldly from the backbone, then turn sharply and drop in an almost vertical direction, giving a flat, straight side.

From a packer's standpoint, a bacon hog cannot have too long a *side*, but the breeder must exercise care that he does not secure this extreme length at the expense of constitution. It is well to avoid extremes of all kinds. It is absolutely necessary, however, that the hog should have good length of side, much more than is found in the fat type.

The *rump* affords a valuable cut, but a flat, broad rump indicates the presence of too much fat. The rump should be the same width as the back, should be very smooth, and slightly rounded from side to side over the top.

Great, broad, bulging *hams* are not wanted on the bacon hog. Such hams carry too much fat, and require severe trimming in preparing the side of bacon for market. The ham of the bacon hog is smooth and firm, and tapers toward the hook. The flesh should be carried well around the bone, leaving no bareness of bone on the inside of the thigh.

Bacon Breeds.—The leading breeds of the bacon type of swine are the Tamworth and Large Yorkshire.

DESCRIPTION AND SCALE OF POINTS FOR BACON TYPE.

A. General Appearance :

	Counts.
<i>Size</i> —Well developed for age	5
<i>Form</i> —Long, smooth, all parts proportionately developed so as to give the impression of a well-balanced, strongly-built animal. Top line, strong; under line, straight; belly, trim and neat	10
<i>Quality</i> —Hair, fine; skin, smooth, showing no tendency to wrinkle; bone, clean and strong but not coarse; flesh, firm and smooth, with no flabbiness at jaw, foreflank, belly, or ham	10
<i>Condition</i> —Well covered with firm flesh, especially along back and loin, but not heavily loaded with fat	6
<i>Style</i> —Active and sprightly, walking without a swaying movement, and standing up well on toes. Breeding animals should show strong character	4

B. Head and Neck :

<i>Snout</i> —Medium length and moderately fine	1
<i>Face</i> —Broad between eyes; poll, broad and full	1
<i>Eyes</i> —Good size, full and bright	1
<i>Jaw</i> —Fair width and muscular, but very neat, showing no flabbiness	2
<i>Ears</i> —Moderately thin, and fringed with fine hair	1
<i>Neck</i> —Medium length and muscular, but possessing no tendency to arch on top	2

C. Fore Quarters :

<i>Shoulders</i> —Smooth, somewhat rounded from side to side over top, and very compact; no wider than back, and not running back on side so as to shorten distance between shoulders and ham	6
<i>Breast</i> —Good width and full	3
<i>Fore Legs</i> —Set well apart, medium length, and straight; pasterns, upright; bone, clean and strong; feet, medium size and strongly formed	4

D. Body :

<i>Back</i> —Medium width, rising slightly above the straight line, and forming a very slight arch from neck to root of tail	6
<i>Loin</i> —Wide as rest of back, strong and full, but not unduly arched	5
<i>Ribs</i> —Good length and moderately arched	4
<i>Side</i> —Fairly deep; long, smooth, and straight between shoulder and ham; a straight-edge laid over shoulder point and ham should touch the side throughout	8
<i>Heart Girth</i> —Full, but not flabby at fore flanks, filled out even with side of shoulder; there should be no tucked-up appearance back of fore legs, nor droop back of shoulder top	5
<i>Flank</i> —Full and low	2

E. Hind Quarters :

<i>Rump</i> —Same width as back; long and slightly rounded from a point above hips to tail, and somewhat rounded from side to side over top	4
<i>Ham</i> —Full without flabbiness; thigh, tapering towards hock without wrinkles or folds, and carrying flesh well down towards hock	6
<i>Hind Legs</i> —Medium length; hocks, set well apart, but not bowed outward; bone, clean and strong; pasterns, upright, feet, medium size and strongly formed	4

Total 100

THE FAT TYPE.

The fat or lard type of hog is characterized by a compact, thick, deep, smooth body, remarkable for its depth and thickness rather than its length. There should be a proportionate development of the different parts, and all parts should blend smoothly together, giving what is called compactness of form. The hams, back, and shoulders are the most valuable parts from a market standpoint, and should be largely developed. The market hog should be fattened to a high degree, because lard is an important consideration with the packer, and a well-fattened hog will dress a larger percentage of its live weight than one which is not well finished, which is another important point with the packer.

Quality is denoted by fine hair, smooth, clean skin, rather fine, clean bone, and even distribution of flesh. There should be no wrinkles in the skin, the jaw should be broad, plump, and full, but not flabby, and the belly should be reasonably trim, that is, not sagging or baggy in appearance. In breeding animals, some allowance would have to be made for sows which had produced several litters of pigs.

The animal should be able to walk freely, without apparent effort, and the *pasterns* should be short and upright.

The *snout* should be moderately fine, the face wide between the eyes, and the poll wide and full. Width between the eyes and fullness of poll denote a good feeder. The *eye* should be full, bright and of good size, and there should be an absence of creases and folds of fat about the eyes. The size and shape of the *ear* varies in different breeds, but the ear should be fine, soft, and generally somewhat small.

The *neck* should be full, broad, deep, smooth, and firm, carrying its fullness well toward the point of the shoulder. The *neck* should be short and deep, and should blend smoothly into the shoulder at all parts.



Fig. 3. Champion barrow at the International Live Stock Exposition, Chicago. This shows practically perfection of form from the fat or lard type standpoint.



Fig. 4. and champion pen of barrows at the International Live Stock Exposition, Chicago.

The *shoulder* of the fat hog has considerable market value, and hence should be large and well developed. It should be broad, deep, and smooth; compact on top, blending smoothly into the body, and being well covered with flesh over all its parts. The *breast* should be wide, deep, and full, denoting constitution; and the *fore-legs* should be set well apart, short, tapering, and straight. The *pasterns*

should be upright, the bone rather fine and clean cut in appearance, and the feet strongly formed.

Along the region of the back and loin lie some of the most valuable cuts, and, therefore, large development is asked for in this region. The *back* should be broad, straight, or very slightly arched, medium length, uniform width from shoulder to ham, thickly fleshed, even, and smooth, without creases or lumps. The *loin* should be broad, strong, full, and thickly and smoothly fleshed. The *ribs* should be well sprung, and the side deep, smooth, and even between shoulder and ham.

The *heart-girth* should be large, the animal being full back of the shoulder, and deep and full at the fore flanks. The hind flank should also be deep and full.

The *ham* is another important consideration from a packer's standpoint. It should be broad, deep, plump, smoothly and heavily fleshed, with the flesh carried



Fig. 5.—Champion pen of Berkshire barrows at the International Live Stock Exposition, Chicago.

well down towards the hock on the inside as well as at the rear. The *rump* should be the same width as the back, long, smooth, and slightly rounded from the loin to the base of the tail. The *hind legs* should be short, straight, set well apart and squarely under the body, with bone, pasterns, and feet as already described.

The above description gives a fairly clear impression of the general type of the fat hog, and shows how well the type meets the requirements of feeders in the corn belt.

Breeds of the Fat Type.—Poland-China, Berkshire, Chester White, and Durco-Jersey are the most popular breeds of the fat type. Others of less importance in America are Cheshire, Victoria, small Yorkshire, Essex, and Suffolk.

The Hampshire is intermediate between the lard and bacon types, and the same may be said of the more lengthy type of Berkshire.

DESCRIPTION AND SCALE OF POINTS FOR FAT TYPE.

A. General Appearance :

Counts.

Size	Well developed for age	6
Legs	Deep, thick, smooth, low set, good length, but compactly built, stand on well-placed legs. Top line straight, or slightly arching; under straight; belly, trim and neat.	10
Quality	Hair, fine; skin, smooth, showing no tendency to wrinkle; bone, clean and fine; flesh, smooth and mellow, but showing no flabbiness	10
Condition	Deeply and evenly covered with flesh, but not overdone for the purpose for which the animal is intended	6
Stance	Active and sprightly, walking without a swaying movement, and stand well up on toes. Breeding animals should show strong character.	4

B. Head and Neck :

Snout	Moderately fine	1
Face	Broad between eyes; poll, broad and full	1
Eyes	Good size, full and bright	1
Jowl	Full, broad, deep, smooth, and firm, carrying fullness back near to point of shoulder	2
Ears	Medium size, fine, and soft	1
Neck	Short, thick and deep. Rounding and full from poll to shoulder top.	2

C. Fore Quarters :

Shoulders	Broad and compact on top, deep, well fleshed, blending smoothly with neck and body	6
Breast	Wide, deep and full	3
Fore Legs	Set well apart, short, tapering, and straight; pasterns, upright; bone, clean and fine; feet, medium size and strongly formed	3

D. Body :

Back	Broad, straight or very slightly arched, medium length, uniform width from shoulder to ham, thickly fleshed, even, and smooth, without creases or projections	8
Loin	Broad, strong, full, and thickly and smoothly fleshed	5
Ribs	Long and well sprung	4
Side	Medium length, deep, smooth, even between shoulder and ham	6
Heart Girth	Large, full back of shoulder, and deep and full at fore flanks.	5
Flank	Deep and full	2

E. Hind Quarters :

Rump	Same width as back, long, smooth, slightly rounded from loin to base of tail	4
Ham	Broad, deep, heavily fleshed, plump, and reasonably smooth; flesh carried well down to hock on inside as well as at rear	8
Hind Legs	Short, straight, set well apart and squarely under body; bone, clean; pasterns, strong; feet, medium size and strongly formed.	3
Total	.....	100

RELATION OF BREED AND TYPE TO ECONOMY OF PRODUCTION.

Probably the most extensive tests with breeds of swine have been conducted by the Ontario Agricultural College and the Iowa State Experiment Station. At the Ontario Agricultural College, five tests were conducted in which six breeds of swine were compared as to the amount of feed required for 100 pounds gain live weight. At the Iowa Experiment Station, three tests were made in which the same breeds were compared as to the amount of feed required for 100 pounds gain live weight. The results of these two series of tests are, therefore, of considerable importance. In the Ontario tests, only the meal is considered in four of the tests, such feeds as dairy by-products and green feed, which were the same

for all breeds, being omitted. In one test, the results are given in terms of dry matter.

Ontario Feeding Trials.—Following are the results of the Ontario tests:

MEAL CONSUMED PER 100 POUNDS GAIN IN WEIGHT.

1st Test.

	Pounds		Pounds
Berkshire	398	Duroc-Jersey	424
Tamworth	400	Chester White	452
Poland-China	417	Yorkshire	468

2nd Test.

	Pounds		Pounds
Berkshire	327	Chester White	340
Tamworth	331	Yorkshire	341
Poland-China	333	Duroc-Jersey	358

3rd Test.

	Pounds		Pounds
Yorkshire	350	Chester White	378
Berkshire	370	Tamworth	379
Duroc-Jersey	376	Poland-China	382

4th Test (Dry Matter).

	Pounds		Pounds
Berkshire	318	Chester White	337
Tamworth	331	Duroc-Jersey	337
Yorkshire	335	Poland-China	350

5th Test.

	Pounds		Pounds
Berkshire	409	Chester White	437
Yorkshire	422	Tamworth	46
Duroc-Jersey	426	Poland-China	474

Before any comment is made on the Ontario results, we will look at the Iowa results, which are based upon dry matter.

Iowa Feeding Trials.—Following are the results of the Iowa tests:

POUNDS DRY MATTER CONSUMED PER 100 POUNDS GAIN IN WEIGHT.

1st Test.

	Pounds		Pounds
Duroc-Jersey	386	Poland-China	424
Yorkshire	398	Chester White	460
Tamworth	403	Berkshire	462

2nd Test.

	Pounds		Pounds
Duroc-Jersey	337	Poland-China	392
Yorkshire	365	Chester White	394
Berkshire	381	Tamworth	407

3rd Test.

	Pounds		Pounds
Poland-China	441	Chester White	506
Berkshire	481	Duroc-Jersey	506
Yorkshire	505	Tamworth	555

These results suggest some difficult questions. Why, for instance, do Berkshires, Duroc-Jerseys, and Poland-Chinas range all the way from the top to the bottom of the list in the different tests; and why should an average of the Ontario tests give a rating of the breeds which is entirely different from an average of the Iowa tests? The averages have been purposely omitted, because they are entirely misleading in a case of this kind. For example, one breed may suffer in some unfavorable circumstance in one or more of the tests which is in no way related to or influenced by the breeding of the animals, yet this circumstance may seriously affect the standing of the breed in question.

Eliminating averages and looking over the individual tests with an unprejudiced mind, we can scarcely escape the conclusion that the factor which placed a certain group at the top in any of the tests was in no way related to the breed represented by that group.

This point is further emphasized by a test reported by Professor Burns in Texas Bulletin 131. In this test "razor backs" or scrubs were fed against good average Poland-China grades. The Poland-China grades made more rapid gains and sold for a higher price per pound, but the cost of producing 100 pounds of gain was practically the same for both, being approximately \$6.02 for the scrubs and \$7.01 for the grades, a difference of two twenty-fifths of a cent per pound.

If any person wishes to test the question further, let him take 8 or 10 pigs of the same litter, divide them into two groups as nearly even as possible, and feed the two groups exactly the same. The question of breed cannot enter into such a comparison, but in almost any such test it will be found that there is a difference in the amount of feed required for 100 pounds gain in the two groups.

Bacon and Fat Types Compared.—Another interesting point brought out in these breed tests is the fact that the bacon type is able to hold its own against the lard type in economy of production. Take the two bacon breeds, Yorkshire and Thorworth, in the Ontario tests, and compare their standing with such breeds as the Poland-China, Chester White, and Duroc-Jersey; or take the Yorkshire in the Iowa tests and compare it with the other breeds. So far as breed tests go, therefore, they fail to demonstrate that it costs any more to put a pound of gain on a hog of bacon type than it does to put a pound of gain on a hog of lard type.

Conclusion.—Breed tests, therefore, have served a useful purpose in demonstrating that no one breed is superior to all other breeds in ability to make cheap gains. A healthy, thrifty hog will make economical gains no matter what breed it represents.

PART III.

INVESTIGATIONS WITH SWINE

Instead of the question to review in detail all the work of experiment stations in swine feeding, but there are certain phases of the work which may be dealt with in a somewhat general way. The problems which face the swine feeder are numerous, and the experiment stations have been working for years to find solutions for some of them. To solve any problem in stock feeding is a tedious matter, because animals differ so much individually in their ability to utilize feed, that it requires many repetitions and the employment of large numbers of animals

to answer an apparently simple question. Great care is necessary, therefore, in interpreting the results of live stock experiments, and it will not do to draw general conclusions where only a limited amount of work has been done.

INFLUENCE OF FEED UPON THE BODY OF THE PIG.

In his excellent book, "Feeds and Feeding," Professor Henry gives an account of work done along this line by Sanborn at the Missouri Agricultural College, Henry at the Wisconsin Experimental Station, Shelton in Kansas, Duggar in Alabama, and Fortier in France.

Corn, which is the standard hog feed of the United States, is a feed rich in carbohydrates, or fat-forming constituents, but rather low in protein, or muscle-forming constituents. It is also low in ash, or bone-forming material. The question arose, therefore, whether a feed such as corn would not have a tendency to produce more fat in the body of a hog than would feeds which contain a higher percentage of protein and ash. Without going into details, it may be said that corn was fed in opposition to mixtures containing such feeds as dried blood, wheat middlings, peas, skim-milk, bran, and cow-peas, which are feeds much richer than corn in protein.

Results.—The methods employed in the investigation varied somewhat, but the general results were as follows:

1. The pigs fed the protein-rich ration generally dressed a somewhat lower percentage of their live weight than those fed the corn ration.
2. In nearly every case, the pigs fed the protein-rich ration had the largest quantity of blood, and in every case they had heavier livers than the others. Their kidneys were also heavier, as a rule, though there were some exceptions.
3. In the Wisconsin and Kansas experiments, the tenderloin muscles were removed and weighed, and in both cases these were heavier in the case of the protein-fed pigs. The tenderloin muscle is an indication of the amount of lean throughout the carcass, and hence it was demonstrated that the carcasses of the protein-fed pigs contained more lean than the others.
4. As a rule, the corn-fed pigs gave more leaf-lard than the others.
5. At the Wisconsin and Kansas stations, the breaking strength of the thigh-bones was tested by a machine designed for such purposes, and in every case the bones from the pigs fed the mixed ration proved stronger than those of the corn-fed pigs, the difference being as high as 32 per cent. in one trial.

Limitations.—Though the experiments described demonstrate very clearly that it is possible to modify the carcass of the pig by a judicious selection of feeds we must not assume that lean or fat can be developed to any extent which the feeder may desire. Nature has set a limit in this connection, and what may be accomplished by the feeder in the way of developing lean meat cannot go beyond a certain point. The theory that any breed of hogs can be fed in such a way as to produce choice bacon for the English market is not borne out by these or any other experiments, nor by the experience of practical breeders who really understand the demands of the market.

A peculiar feature of swine is their tendency to develop fat. If the very best specimens of the bacon type are fed largely upon corn, they quickly assume the fat or lard type, and in one or two generations of such treatment the tendency to become shorter in side and thicker in body becomes so firmly fixed that the very

change them back to the bacon type again under any system of breeding. On the other hand, breeders of bacon hogs know that it requires selection and feeding to maintain the type. Even under the most favorable conditions there is a tendency for the bacon type to change gradually in the direction of the fat type, unless care is exercised in selection. It is safe to say, however, that it is easier to increase the proportion of fat in a hog's carcass than to increase the proportion of lean, and that the extent to which the lean may be increased by the character of the feed is very limited and is fixed by the inheritance of the animal. Further, any attempt to increase the amount of lean in a hog's carcass must be started when the pig is very young in order to be successful.

Causes of Soft Bacon.—In the manufacture of "Wiltshire sides" Canadian breeders have experienced a great deal of difficulty with sides turning soft during the process of curing. In a soft side the fat is soft and spongy, and sometimes the lean is affected. A really soft side is practically worthless, and even a slight degree of tenderness detracts very seriously from the value of the bacon.

The Ontario Agricultural College, Guelph, and the Central Experimental Farm, Ottawa, Canada, have conducted exhaustive experiments in connection with the cause of soft bacon, and following are the principal points brought out in the investigation:

1. *Lack of Maturity.*—Generally speaking, the more immature a hog is, the greater the tendency to be soft. Almost invariably the largest percentage of softness occurs among the light sides of bacon.

2. *Lack of Finish.*—Thin hogs have a marked tendency to produce soft bacon. Marketing hogs before they are finished is, no doubt, responsible for a great deal of softness.

3. *Unthriftness* in hogs, no matter what the cause may be, almost invariably produces soft bacon.

4. *Lack of exercise* has a tendency to produce softness, but this tendency can be largely overcome by judicious feeding.

5. *Exclusive meal feeding* is perhaps one of the most common causes of softness, especially when hogs are not given exercise. Some kinds of meal are more injurious than others, but wherever exclusive meal feeding is practised and the exercise is limited, more or less softness is always sure to result.

6. *Corn.*—Of the grains in common use, corn has the greatest tendency to produce softness. Its injurious tendency can be modified by mixing it largely with other feeds, or by feeding skim-milk, green feed, and roots, but its tendency to produce softness is so strong that it must be regarded as an undesirable food for bacon hogs.

It appears to give a good quality of meat in the case of the lard hog, but it must be remembered that the bacon hog is marketed at lighter weights and in better condition than the lard hog, and possibly this may explain why corn is so commonly used for feeding bacon hogs. It is possible also that the difference in the methods of curing may have an influence. Beans seem to have a more marked effect than corn in producing softness, and should not be used for finishing bacon hogs.

VARIOUS GRAINS, MEALS AND BY-PRODUCTS.

Corn.—Corn is essentially a fat forming feed, and is not a good bone and muscle former. The evil effects of exclusive corn feeding are most con-

spicuous in the case of young growing pigs or in the case of feeding stock, especially sows during the period of gestation. Corn may be fed either whole or ground, results of experiments varying widely as to relative merits of the two methods of feeding. Bulletin 106 of the Iowa Experiment Station reports results of two years work upon different methods of feeding corn, and the following extracts are taken from the conclusions published in the bulletin: "The fastest and most profitable gains were secured by feeding dry ear corn until the hogs were close to 200 pounds in weight. Then, if the hogs were to be fed longer and the weather permitted, the most profitable gains were secured by changing them to soaked shelled corn . . . It proved useless to grind corn for hogs of any age when the weather was warm enough to permit soaking. In every case where grinding has shown a saving of corn, simply soaking twelve hours in water has shown a still greater saving."

Fed by itself, corn does not give very large gains with hogs. Figures compiled from a large number of tests show an average of 10.25 pounds gain in weight from a bushel of corn. Young pigs fed on corn alone often become dwarfed, over-fat, and weak in bone. In such cases, the addition of bone meal, or even hardwood ashes, to the corn ration, will effect a marked improvement. The greatest improvement, however, is effected by the use of foods rich in protein along with corn. Supplementing corn with foods rich in protein has been tested by many experiment stations, and in every case the hogs have made greater and cheaper gains than when corn was fed alone. Among the most effective feeds to supplement corn are the by-products of packing houses, such as blood meal, meat meal, and tankage. These products are all extremely rich in protein, and must be fed in small proportions to be economical. Pea meal, linseed meal (ground oil cake), soy bean meal, wheat middlings, barley, skim-milk, as well as alfalfa and other pasture crops, have all been used with corn to excellent advantage. The richer the supplementary feed is in protein, the smaller the proportion it is necessary to use.

Peas, or Canada Field Peas.—This grain is comparatively little known in the United States, and is used to a smaller extent for pig feeding in Canada than it was some years ago, mainly owing to the high price it commands for other purposes.

At the Utah Experiment Station, hogs fed upon ground peas and bran, equal parts, made an average daily gain of 1.09 pounds and required 363 pounds of meal for 100 pounds of gain; while hogs fed corn and bran made an average daily gain of .63 pound and required 455 pounds for 100 pounds of gain.

At the South Dakota Station the daily gain of pigs fed whole soaked peas was 1.21 pounds, and for soaked corn meal 1.40 pounds; but the grain required for 100 pounds gain was 421 pounds for the pea group and 458 pounds for the corn lot.

The Ontario Agricultural College found that feeding pea meal alone was injurious to pigs, the heavy, close nature of the meal making it indigestible. This peculiarity of pea meal is generally recognized. Pea meal alone was less satisfactory than corn meal alone, but when mixed with one-third of its weight of wheat middlings it gave much better results than corn meal.

Pea meal is very rich in protein and should make a good supplementary feed with corn.

Barley.—Barley is richer in bone and muscle-forming constituents than corn, having a higher percentage of ash and protein. In fattening constituents it is scarcely equal to corn.

Wisconsin Experiment Station reports two feeding trials with barley and corn. In the first trial the grains were fed alone, and in the second they were fed in combination.

The first of the two trials shows that it required 471 pounds of barley to produce 100 pounds of gain, and 435 pounds of corn to produce 100 pounds of gain. In the second trial it required 330 pounds of barley and 398 pounds of skim-milk to produce 100 pounds of gain, and 306 pounds of corn and 371 pounds of milk for the same amount of gain. In each trial, therefore, it required more barley than corn to produce the same amount of gain.

The North Dakota Station found barley and corn practically equal as pork ration, requiring 453 pounds of corn and 457 pounds of barley, respectively, to produce 100 pounds of gain.

The Michigan and Ontario experiments were in favor of barley as compared with corn.

The first Wisconsin trial gave the most marked results in favor of corn, and it is of note that the hogs in this trial averaged over 200 pounds in weight at the commencement of the trial. Where younger hogs were used, barley made a better showing as compared with corn. There is little doubt that, considered as a ration, corn is superior to barley, and hence well-grown pigs should be able to do better on exclusive corn feeding much better than younger pigs. The writer's experience would lead him to prefer barley to corn as a meal ration for growing hogs. This view is borne out by the experiments noted. The extensive use made of barley for swine feeding in Canada, Great Britain, Denmark, and other countries is a strong evidence of its value.

One of the advantages of barley is the fact that it is not eaten so readily by pigs as corn. It should, therefore, be mixed with some other feed, to increase its palatability. Barley is well adapted to mixing with corn as a ration for almost all classes of pigs.

Wheat.—Wheat has been experimented with, more or less, as a feed for swine, and the results show that there is comparatively little difference between wheat and corn in feeding value. Wheat contains less fibre than barley, but ground wheat can hardly be regarded as a satisfactory ration, owing to the fact that it tends to cause digestive troubles. It gives much better results when mixed with corn meal, and combines well with corn. As a general thing, feeding sound wheat is one of the questions, owing to its relatively high price. It is only under special circumstances that it can be counted among feeds for swine. The Michigan Experiment Station secured better gains for feed consumed from wheat than from corn in each of two tests, reported in Bulletin 74.

Frozen Wheat.—In some years, considerable of this product is placed upon the market. It is often unfit for milling, and yet be practically equal to sound wheat for feeding purposes. Frozen wheat varies much in character, depending upon the degree of damage reached by the grain before being frozen.

In the evidence before the Committee on Agriculture, J. H. Grisdale, of the Central Experimental Farm, Canada, gives details of swine feeding experiments with wheat, fed alone and in combinations. The following table brings out the principal points:

Character of Ration	Average Weight of Pigs at Commencement	Average Daily Gain	Pounds Meal per 100 Pounds Gain
	lbs.	lbs.	lbs.
Lot 1. No. 1 Frozen Wheat 2 Parts, Shorts 1 Part.....	99.1	.76	390
Lot 2. No. 1 Frozen Wheat 2 Parts, Corn 1 Part.....	76.	.77	370
Lot 3. No. 2 Frozen Wheat 2 Parts, Corn 1 Part.....	118.2	1.03	390
Lot 4. No. 2 Frozen Wheat only.....	140	1.23	360
Lot 5. No. 2 Frozen Wheat only.....	85	.71	380
Lot 6. No. 2 Frozen Wheat 2 Parts, Barley 1 Part.....	104.1	.81	410
Lot 7. No. 1 Frozen Wheat 2 Parts, Oats 1 Part.....	112.1	1.02	390
Lot 8. No. 1 Frozen Wheat 2 Parts, Oats 1 Part.....	74.2	.66	390
Lot 9. No. 2 Frozen Wheat with 3 lbs. Skim- Milk daily per. Pig.....	99.	.86	340
Lot 10. No. 1 Frozen Wheat only.....	150.4	.94	410
Lot 11. No. 1 Frozen Wheat only.....	96.3	.79	390
Lot 12. Equal Parts No. 1 Frozen Wheat, No 2 Frozen Wheat and Corn.....	124.8	.94	470

It is unsafe to make comparisons of the different rations, but the table fails to show any advantage of the No. 1 frozen wheat over the No. 2.

The most remarkable feature of the experiment is the uniformly good results obtained with all the groups, indicating frozen wheat to be a valuable feed for swine.

The same would probably be found of wheat slightly affected with smut disease and of otherwise shrunken wheat.

Frozen Wheat vs. Barley.—At the Ontario Agricultural College, the writer fed three lots of pigs to compare frozen wheat with barley. The frozen wheat tested only 43½ pounds per bushel.

Lot 1 contained 18 pigs and was fed ground barley and wheat middlings.

Lot 2 contained 20 pigs and was fed ground frozen wheat and wheat middlings.

Lot 3, contained 18 pigs and was fed ground barley and frozen wheat, equal parts, with middlings.

The proportion of middlings varied, being reduced as the experiment progressed, but was the same for all lots.

The pigs in lot 1 averaged 41 pounds in weight at the start, lot 2, 37.7 pounds, and lot 3, 54.5 pounds.

Lot 1 made an average daily gain per pig of 1.08 pounds, lot 2, 1.1 pounds, and lot 3, 1.18 pounds.

The amount of meal consumed per 100 pounds gain was as follows.

Lot 1, 430.9 pounds; lot 2, 431.4 pounds; lot 3, 432.9 pounds.

Both in rate of gain and feed consumed per 100 pounds gain the three rations may be said to have given practically the same results. In this experiment, therefore, frozen wheat proved equal to barley when fed with middlings.

Oats.—Owing to their high percentage of fibre, oats do not possess a high value for fattening hogs. When used at all, they should be used as a comparatively small part only of the ration, and they show to best advantage when used to lighten and give more bulk to a heavy, close-textured meal, such as pea meal, or even corn

They are especially useful for making up part of the ration of boars or sows, where the aim is to maintain vigor without unduly fattening.

Rye.—Extensive Danish experiments, summarized by Professor Henry in "Rye and Feeding," indicate that rye and barley are about equal in value for pig feeding. Very little experimental work with the grain of this cereal has been done in America. Rye meal is best fed in combination with other kinds of meal.

Buckwheat.—The Central Experimental Farm, Canada, reports two trials in which buckwheat was compared with wheat. In the first trial, ground buckwheat was fed against ground wheat, and in this trial 415 pounds of ground buckwheat were required for 100 pounds gain, and 410 pounds ground wheat for 100 pounds gain.

In the second trial, one lot of pigs was fed a mixture of one-half ground buckwheat and one-half mixed meal, and the other lot a mixture of one-half ground wheat and one-half mixed meal. In this trial it required 405 pounds of the buckwheat mixture for 100 pounds of gain, and 380 pounds of the wheat mixture for 100 pounds gain. This is a much better showing for buckwheat than might be expected, since buckwheat has a thick, fibrous hull which the hog cannot digest. Ground wheat showed an advantage of only about $8\frac{1}{2}$ per cent. over ground buckwheat, and the wheat mixture an advantage of $6\frac{1}{2}$ per cent. over the buckwheat mixture.

Emmer.—This grain is commonly known as "spelt" or "speltz." Genuine emmer is a distinct plant, possessing general characters similar to emmer, but is a smaller, older and possesses about ten per cent. more hull than emmer.

The South Dakota Station reports one experiment with emmer, under the name of "speltz." One lot of pigs was fed whole emmer, one ground emmer, and one ground emmer and corn. Whole emmer required 771 pounds of feed for 100 pounds gain, ground emmer 826 pounds, and emmer and corn 529 pounds. It will be seen that marked improvement was effected when corn was added to emmer. Apparently emmer has too much hull or husk (about 21 per cent.) to make a first-class feed. Its rational use would be for mixing with concentrated, heavy meals to make a bulk to the ration.

Millet Seed.—The South Dakota Station (Bulletin 83) reports a comparison of millet seed with barley and wheat. The authors of the bulletin state that millet seed can be grown profitably as a fattening ration for swine, but it does not make as good a ration as barley or wheat. It is also stated that it required 100 pounds of millet than it did barley meal, and a trifle more barley meal than it did wheat meal to make a pound of grain, and that a bushel of 56 pounds of millet seed was equal to a bushel of 46 pounds of barley for hog feed. Millet meal produced a greater amount of fat than did either barley or wheat meal.

Beans.—Beans are best thoroughly cooked before they are fed to swine. The Michigan Experimental Station reports results from feeding growing pigs and fattening pigs. Without going into details, it may be said that an exclusive ration of beans is not regarded as satisfactory. For example, a ration consisting of three parts beans and four parts corn meal was not so satisfactory as a mixture of two parts beans, two parts wheat meal and three parts corn meal. The last named mixture gave an average of about one and one-third pounds, which is regarded as

Three trials of beans compared with equal parts beans and corn meal were made with fattening hogs. The results of the three trials are briefly summarized in the following table:

	Fed Beans Alone.	Fed Equal Parts, Beans and Corn
	lbs.	lbs.
Average live weight of hogs	163	159
Average daily gain per hog	1.1	1.52
Average feed consumed per 100 pounds gain	420.9	406.4

The addition of corn meal increased the efficiency of the ration about $3\frac{1}{2}$ per cent.

The relative cost of the two feeds and the cost of cooking would have to be considered by the feeder in coming to a decision regarding the economy of the rations.

Wheat Middlings.—Wheat middlings, frequently called "shorts," is one of the very best feeds for young pigs. It is rich in bone—and muscle—forming constituents, and does not tend to make growing pigs too fat. Its value as a supplement to corn has already been noted, and it combines well with almost any kind of meal. As a single feed for fattening, it is not economical, but it is conducive to thrift and growth when used as a part of a meal ration for fattening pigs. The younger the pig the greater the value derived from feeding middlings.

Wheat Bran.—Bran is too bulky and fibrous to constitute a large part of a pig's ration, but is useful for mature animals, such as stock boars and breeding sows, or where it is desired to give bulk to a ration that is considered too heavy in character. As a rule, however, middlings can be used to better advantage than bran for the purposes mentioned.

Flour.—Various brands of low-grade flour are occasionally put upon the market. Low-grade flour has a higher feeding value than middlings, but is entirely unsuitable for feeding alone, owing to its pasty nature. The writer's experience is that it will cause digestive derangement when fed alone, and must be diluted to a large extent with other feeds. Bulletin 167 of the Virginia Experiment Station reports better results from soaking low-grade flour than from feeding it freshly mixed with water.

Corn-and-Cob-Meal.—The Iowa Experiment Station reports a test of corn-and-cob meal, both dry and soaked, and a summary of the results is given below. The test lasted 140 days.

Kind of Feed.	Average Daily Gain per Pig.	Pounds Corn Re- quired for 100 Pounds Gain.
	lb	lbs.
Dry corn .....	.74	456
Soaked corn .....	.63	517
Soaked corn meal .....	.72	555
Soaked corn-and-cob meal .....	.56	583
Dry corn meal .....	.61	595
Dry corn-and-cob meal .....	.51	604

In the table given above the cob has been deducted from the figures for corn-and-cob meal, so that the actual corn is compared in all cases.

It cost 6 cents per bushel to grind the corn-and-cob meal, and 2 cents per bushel to grind corn meal. The results of the test were regarded as so conclusive against corn-and-cob meal that no further tests were made.

The Missouri Experiment Station also gives a decidedly adverse report upon feeding corn-and-cob meal to hogs, but Kansas and New Hampshire report in its favor.

Gluten Meal.—The Central Experimental Farm, Canada, reports favorably upon gluten meal as a feed for swine. J. H. Grisdale says regarding it: "Gluten has been fed in limited quantities, but has not proven very satisfactory for either bacon production, young pigs, or breeding stock. It seems to be rather unpalatable, and produces soft bacon."

The Cornell Station also gives an unfavorable report of this feed as compared with corn when both feeds were fed with skim-milk.

Linseed Meal.—(Oil Meal)—Linseed meal has been referred to under supplementary feeds with corn. It is seldom advisable to feed linseed meal to a greater extent than one-fifth of the total meal ration, and, as a rule, half this quantity will be found more economical. It is highly recommended by some as a feed for nursing sows, and for young pigs after weaning. The writer has had only fair success in its use as a substitute for skim-milk with young pigs.

In experiments with substitutes for skim-milk for young pigs, the Central Experimental Farm, Canada, obtained an average daily gain of six-tenths of a pound per pig with a mixture consisting of four parts wheat middlings and one part linseed meal. It required 280 pounds of the mixture for 100 pounds of gain, which is a very satisfactory showing. The linseed meal was not so satisfactory as skim-milk, but gave better results than other substitutes for skim-milk tested at the same time.

Cottonseed Meal.—This very concentrated feed possesses some property which renders it fatal to hogs when used in considerable quantities. A small allowance per day may be fed without injurious results, but great care is necessary. There does not seem to be any good reason for feeding cottonseed meal to hogs in Canada.

Oat Feed.—This by-product of the oatmeal mill sometimes has a considerable value, but, owing to the fact that it often contains a large proportion of water, it is not a very satisfactory feed to buy for swine. Experiments with oat feed are not satisfactory, because the product is anything but constant in composition. The same remarks apply to all by-products of the oatmeal mills, under whatever name they may be sold.

Brewers' and Distillers' Grains.—Grisdale, of the Central Experimental Farm, reports economical gains from "spirit grains" when fed in combination with a meal ration. Generally speaking, these products are rather bulky and are for swine, unless used in limited quantity as a supplement to a grain ration. They may be used much the same way as alfalfa hay or roots may be used.

Sugar-Beet Pulp.—In the wet state this product may be regarded as similar in feeding value to roots, and may be employed in exactly the same way. The dried pulp is hardly a satisfactory feed for swine.

Beet-Sugar Molasses.—Beet molasses is unpalatable and generally unsatisfactory for swine. Bulletin 199 of the Cornell Experiment Station reports apparent poisoning of hogs fed beet molasses; and Utah (Bulletin 101) reports scouring, and bad-flavored pork.

Black-Strap Molasses.—Texas Bulletin 131 reports a test with ground corn compared with ground corn and black-strap molasses. Three groups of hogs were used. Lot 1 was fed equal weights of ground corn and molasses. Lot 2 was fed two parts ground corn to one part of molasses by weight. Lot 3 was fed ground corn alone. There were eight hogs in each lot, and the test lasted 91 days. The average weight of the hogs at the commencement of the test was approximately 120 pounds each. Ground corn was valued at \$28.20 per ton, and molasses at \$16.66 per ton.

The average daily gain per hog and cost of gain were as follows:

		Average Daily Gain. Cost 100 Pounds Gain.	
Lot 1.	Corn and molasses, equal parts .....	.9 pound	\$10.75
Lot 2.	Corn 2 parts, molasses 1 part.....	1.45 pounds	7.53
Lot 3.	Corn alone	1.66 pounds	7.36

In this test molasses proved lower in value than corn. It is pointed out in the bulletin that molasses is poor in protein, and would likely have given better results if fed with a feed richer in protein than corn.

Tankage.—This by-product of the packing house is referred to under supplementary feeds with corn, and also under substitutes for skim-milk. A good brand of tankage contains over 50 per cent. of protein. It is valuable, therefore, to use when the ration is deficient in protein. It costs a high price per ton, but it is necessary to use only a small proportion in the feed, ten per cent. of the total meal ration being sufficient in most cases. When corn constitutes the main ration, or when skim-milk is not available for young pigs, the judicious use of a feed like tankage increases the rate of gain and reduces the cost of each pound of gain.

Weed Seeds.—Professor Henry conducted two trials at the Wisconsin Experiment Station with pigeon-grass seed, cooked and uncooked, for swine. The results are reported in "Feeds and Feeding."

Lot 1 was fed two-thirds cooked pigeon-grass meal and one-third corn meal uncooked.

Lot 2 was fed corn meal only, uncooked.

Lot 3 was fed one-third pigeon-grass meal and two-thirds corn meal, both uncooked.

Lot 1 made the largest gains and required the least feed for 100 pounds of gain, and lot 3 made the smallest gains and required the most feed for 100 pounds of gain.

Professor Henry says: "It is evident that pigeon-grass seed when cooked is a valuable feed for swine . . . To be satisfactory for pig feeding the seed of this grass should be ground and cooked."

At the large elevators, weed seeds and small wheat accumulate in large quantities, and this product can be used to good advantage in feeding swine when judiciously mixed with other meal.

"Stock Feeds"—In Bulletin 151 of the Wisconsin Experiment Station, Prof. L. W. Woll gives a review of the work of experiment stations with so-called "stock feeds," or "condimental stock feeds." In summing up, Professor Woll says, in part: "The feeding experiments include twenty-three different trials, conducted at more than a dozen different experiment stations, with 992 animals in all; viz., with 78 steers, 81 dairy cows, 604 sheep, 112 pigs, and 117 hens.

"In going over the evidence presented, we find that only two out of the twenty-three different trials showed the stock feed to possess any merit; the conclusions drawn from the results of the twenty-one trials is to the effect that nothing was gained by including these feeds in the ration fed; in fact they are shown to be a positive detriment in so far that they rendered the rations more expensive and increased the cost of the product obtained whether this be gain in live weight, more butter fat, wool or eggs."

Among the conclusions drawn from investigation work with "stock feeds" are the following:

"They are of no benefit to healthy animals when fed as directed, either as to increasing the digestibility of the feed eaten or rendering it more effective for the production of meat, milk, wool, etc."

"They are of no benefit as a cure-all for diseases of the various classes of live stock, neither do they possess any particular merit in case of specific diseases, or in restoring animals out of condition, off feed, etc., since only a small proportion of ingredients having medicinal value is found therein, the bulk of the feeds consisting of a filler which possesses no medicinal properties whatever."

"Exorbitant prices are charged for these feeds."

"By adopting a liberal system of feeding farm animals and furnishing a variety of feeds, good results may be obtained without resorting to stock feeds of any kind."

"If a farmer believes it is necessary to feed stock feeds at times, he can purchase the ingredients at a drug store and make his own stock feeds at a fraction of the cost charged for them by the manufacturers."

The following formulas for stock feeds, suggested by two American experiment stations, are given in the bulletin:

"Ground gentian, 1 pound; ground ginger, $\frac{1}{4}$ pound; powdered saltpetre, $\frac{1}{4}$ pound; powdered iron sulphate, $\frac{1}{4}$ pound. Mix and give one tablespoonful in feed daily for ten days, omit for three days, and feed as above for ten days more. Estimated cost, 20 cents per pound. Estimated tonic value, about four times that of most condimental feeds on the market."

"Fenugreek, 8 pounds; ginger, 8 pounds; powdered gentian, 8 pounds; powdered sulphur, 8 pounds; potassium nitrate, 8 pounds; resin, 8 pounds; cayenne pepper, 4 pounds; flax-seed meal, 44 pounds; powdered charcoal, 20 pounds; common salt, 20 pounds; wheat bran 100 pounds."

This mixture is said to be "so near the average stock feed that neither the farmer nor his stock could tell the difference." Estimated cost, less than \$1.42 per hundred pounds.

"Powdered gentian, 1 pound; powdered ginger, 1 pound; fenugreek, 5 pounds; common salt, 10 pounds; bran, 50 pounds; oil meal, 50 pounds. Estimated cost \$1.50 per hundred pounds."

Soil, Coal, Charcoal, and Tonic Mixture.—Bulletin 150 of the Wisconsin Experiment Station gives results of a single test with soft coal, charcoal, and a mixture, made up as follows: Wood charcoal, 1 pound; sulphur, 1 pound; common salt, 2 pounds; bread soda, 2 pounds; sodium hyposulphite, 2 pounds;

sodium sulphate, 1 pound; black antimony, 1 pound. The ingredients of the tonic were pulverized and thoroughly mixed. The cost of the mixture was 4 cents per pound.

Four groups of pigs eleven weeks old were used in the test, and all groups were fed a meal mixture composed of corn meal, wheat middlings, wheat bran, and linseed meal.

Lots 1 and 2 were given free access to soft coal and charcoal, respectively, lot 3 was fed one ounce of the tonic to every 10 pounds of meal, and lot 4 was fed nothing but the meal ration.

The average daily gain per pig in the four lots was as follows: Soft Coal, .695 pound; charcoal, .738 pound; tonic mixture, .958 pound; no corrective, .614 pound.

The cost of producing 100 pounds gain in weight was as follows:

	Lot 1. Soft Coal.	Lot 2. Charcoal.	Lot 3. Tonic.	Lot 4. Nothing.
Meal	\$5.93	\$5.42	\$4.74	\$5.84
Corrective .....	.20	.14	.11	....
Total Cost.....	\$6.13	\$5.56	\$4.85	\$5.84

It will be noticed that the lot receiving the tonic mixture made the most rapid and most economical gains, the lot receiving the charcoal coming second. The hogs which were allowed access to soft coal made greater gains than those fed meal alone, but the gains were more expensive. It is stated that the hogs fed correctives had a decidedly better appetite than those which received none.

The experiment indicates that correctives or tonics may be used to advantage at times, but that it is easily possible to pay too much for them.

PASTURE AND SOILING CROPS.

Alfalfa.—Bulletin 155 of the Kansas Experiment Station gives a summary of results from feeding alfalfa to hogs at that institution. The following is quoted directly from the bulletin:

"At this station some years ago, a gain of 800 pounds of pork was made from a ton of alfalfa hay, and a little less than that amount of gain was made from an acre of alfalfa pasture. In another test here, an acre of alfalfa produced \$20.20 worth of pork, while an acre of rape fed to a similar lot of hogs returned \$10.05 worth of pork.

"In a later experiment we found that 100 pounds of alfalfa hay saved 96 pounds of corn. Figuring on the basis of 5 pounds of corn producing one pound of pork, the 96 pounds of alfalfa would produce 19 pounds of pork. Estimating the average of alfalfa to be four tons per acre, on this basis it would mean a production of 1,600 pounds of pork per acre with alfalfa fed in the form of hay in connection with corn. This experiment was conducted during the winter season.

"In an experiment during the summer, we found that 170 pounds of green alfalfa, cut and fed to hogs fresh in a dry yard, was equal to 100 pounds of corn, and in this experiment it took 6 pounds of corn to produce a pound of pork. Therefore, assuming 170 pounds of green alfalfa would produce 16 2-3 pounds of pork, a fraction over ten pounds of green alfalfa would produce one pound of pork. Estimating that an acre of alfalfa will yield during the season 20,000 pounds of

green hay, this experiment would show that such an acre of alfalfa, cut green and fed in connection with corn, would produce something like 2,000 pounds of pork. Of course this is fed in connection with corn, and a statement that an acre of green alfalfa would produce 2,000 pounds of pork would be very misleading. Figuring on the basis of these two experiments, alfalfa hay, yielding four tons per acre (8,000 pounds), would produce 1,600 pounds of pork, and its value at 4 cents per pound would be something like \$64.00 per acre; and green alfalfa producing ten tons per acre (20,000 pounds) would produce 2,000 pounds of pork, which, at 4 cents per pound, would be worth \$80.00 per acre."

Wyoming Trials.—The Kansas results from feeding alfalfa are about the most favorable of which the writer is aware. Very fair results were obtained at the Wyoming Experiment Station, where alfalfa hay and wheat were fed against wheat alone. In this experiment it required 449 pounds of wheat for 100 pounds of gain where wheat was fed alone; and 319.3 pounds of wheat and 291.3 pounds of alfalfa for 100 pounds of gain where wheat and alfalfa hay were fed. On this basis, a ton of alfalfa hay would give scarcely 200 pounds of pork, which is only one-quarter as much pork as was obtained at Kansas from a ton of alfalfa hay. It is well to remember, however, that alfalfa hay varies very much in quality. Well-cured, fine-stemmed, leafy hay would be best for hog feeding, and coarse-stemmed hay that had been damaged more or less by the weather might have very little value for this purpose. Such a discrepancy as that noted between the Kansas and Wyoming results might easily be accounted for on the basis of different qualities of hay, and in the meantime we may regard the Kansas results as representing the maximum returns from alfalfa. It is also worthy of note that in one Kansas experiment the amount of pork produced by a ton of alfalfa hay was only 235 pounds, an amount only slightly greater than that obtained at Wyoming, so that it would be safe to regard the 300 pounds of pork from a ton of alfalfa hay as a possibility, rather than as something which can be generally depended upon.

The Wyoming Station also tried feeding young pigs, weighing from 60 to 70 pounds on a ration of $\frac{1}{3}$ corn meal, or wheat meal, and 2-3 alfalfa hay, but the pigs lost weight, and one died. On the other hand, mature sows were successfully maintained on a ration of alfalfa hay and turnips without other feed, indicating that alfalfa hay is best suited to pigs that are fairly well grown.

Rape.—Rape is a crop which is highly recommended wherever it can be grown successfully. For hog pasture it is best sown in drills about 28 inches apart at the rate of three pounds of seed per acre. It may also be sown broadcast. In most localities, it is safer not to sow until after the first of June. If there is enough moisture in the soil to germinate the seed, it is generally ready for pasture in about six weeks.

Rape Compared with Alfalfa.—The Kansas Experiment Station compared rape with alfalfa for pigs averaging 52 pounds at the commencement of the experiment. Ten pigs were used in each lot. Following are daily gains per head and pounds of grain consumed per 100 pounds of gain:

	Daily Gain.	Grain Consumed per 100 Pounds Gain.
Lot 1. No pasture	1.04 pounds	371 pounds
Lot 2. Rape pasture	1.09 pounds	301 pounds
Lot 3. Alfalfa pasture	1.10 pounds	200 pounds

An acre of rape was required for ten pigs, but half an acre of alfalfa was sufficient for the same number.

An acre of rape pasture produced 202 pounds of pork, and an acre of alfalfa pasture produced 408 pounds of pork.

"This experiment emphasizes the superior value of alfalfa, and likewise emphasizes the value of dwarf Essex rape, which can be seeded in the feed lot that would otherwise go to waste or grow up to weeds, and be made to pay a handsome profit on the investment."

Rape for Pasture.—At the Wisconsin Experiment Station, Craig conducted two experiments with hogs on rape. In the first experiment, 10 hogs, about eight months old, were pastured on one-third of an acre of rape for 76 days, and fed corn and shorts in addition. Another lot was fed in a pen on corn and shorts only. In the second experiment, 19 hogs were pastured seven weeks on six-tenths of an acre of rape, as compared with a similar lot in pens on grain only.

In the first trial one-third of an acre of rape was equivalent to 1,062 pounds of grain, and in the second trial, six-tenths of an acre of rape was equivalent to 1,330.2 pounds of grain. Therefore, in one case an acre of rape was equivalent to 3,186 pounds of grain, and in the other to 2,217 pounds of grain.

Later, Carlyle, of the same institution, repeated the work and states: "With pigs from four to ten months old, representing the various breeds of swine, an acre of rape, when properly grown, has a feeding value when combined with a ration of corn and shorts equivalent to 2,346 pounds of a mixture of these grain feeds."

The Central Experimental Farm, Canada, reports feeding six pigs on three-sixteenths of an acre of rape pasture from August 14th until snow covered the ground. It is estimated that the rape saved 156 pounds of meal, or an acre of rape would save 832 pounds of meal. This is far short of the Wisconsin returns, but the pigs were young at the commencement of the trial, and it is the writer's experience that young pigs do not make as good use of pasture as older ones.

Rape vs. Clover.—The Wisconsin Experiment Station reports two trials with pigs on rape and clover. In the first trial there were twenty pigs in each group, and in the second trial twenty-one in each group. The pigs were from five to six months old at the commencement. The following table shows gains and feed consumed:

	First Trial		Second Trial	
	Rape.	Clover.	Rape.	Clover.
	lbs.	lbs.	lbs.	lbs.
Average daily gain per pig .....	.87	.78	1.27	1.22
Amount of grain for 100 lbs. gain	391.	439.	332.	340.

It will be seen that the rape gave somewhat better gains with a smaller meal requirement per 100 pounds gain than the clover, though the difference was not great in the second trial.

Rape vs. Soy Beans.—The Ontario Agricultural College fed soy beans and rape to pigs in pens, the green fodder being cut and carried to the pigs. The pigs were fed meal and skim-milk in addition.

An acre of rape furnished 22 tons of green fodder, and an acre of soy beans 15 tons of green fodder.

Soy beans had a higher feeding value per ton than rape, but when the difference in yield was taken into consideration, the two crops proved about equal in amount of pork produced per acre.

Rape has an advantage over soy beans in that it may be sown on a wider range of dates, and retains its green condition for a longer period.

Rape also makes a better pasture crop than soy beans, as it suffers less from tramping.

Clover and Timothy.—In experiments at the Iowa Experiment Station, hogs were pastured upon both clover and timothy. Without going into details, it may be said that the experiments indicate that clover produced pork at the rate of 400 pounds per acre, and timothy at the rate of 278 pounds per acre. This is probably more than can be expected from these crops as a general rule.

Hairy Vetch or Sand Vetch.—This crop is very much relished by hogs, and if sown in the fall gives an early pasture of high nutritive value. Sand vetch is sown in the spring, but it is rather late in the season before it is ready for pasture, and does not give the amount of pasture which is desirable. The liability of hairy vetch to winter-kill in some districts when sown in the fall, and the high price of seed, prevent the crop from becoming widely popular.

Various Forage Crops.—Bulletin 95 of the Missouri Experimental Station reports three years' work with several forage crops.

Shelled corn and corn meal were used to supplement the rape and the various forage; and a ration of corn meal 6 parts and oil meal 1 part was used to supplement the sorghum, blue grass, and rye grain forages.

Blue Grass.—"An average of 12.6 head of hogs was pastured for an average of 155.3 days for the seasons of 1908-09-10, and produced on the average 285.5 pounds of pork which could be accredited to each acre of forage eaten. With pork at 6 cents per pound there was returned per acre of blue grass forage an average of \$17.12. The average amount of grain per pound gain was 4.49 pounds. Provisions from hogs on blue grass forage must be secured early in the season. The blue grass forage became dry and unfit for swine grazing purposes in August."

Alfalfa.—"Under ordinary conditions alfalfa will forage from 10 to 20 head of hogs per acre. A new seeding should be pastured very slightly the first season. No more than ten shoats per acre or one sow and her litter should be used. After the first season as high as 20 head per acre or two sows and their litter may be pastured on it throughout the season." Only one test was conducted with alfalfa and this on newly seeded ground. The test was started with 12 head of hogs per acre, which number was reduced to 10 at the end of eight weeks. The hogs averaged 58.5 pounds at the commencement of the test, and were turned on the alfalfa when it was six inches high. "The average amount of grain required to produce a pound gain was 3.07 pounds. The amount of pork which could be credited to the alfalfa forage was 596.8 pounds per acre. With pork at 6 cents the value of the alfalfa per acre was \$35.71."

Clover.—Two tests were conducted with red clover, and it is stated that hogs will pasture from 8 to 12 shoats per acre. It is recommended not to pasture clover until it is 10 inches high. The bulletin recommends feeding shoats about a pound of corn per head per day.

A herd averaging 11 hogs was pastured for an average of 130 days for the seasons of 1908 and 1910, and produced an average of 572.2 pounds of pork that

could be accredited to each acre of forage eaten. These experiments indicate that a value of 98 cents may be obtained for each bushel of corn fed to hogs pasturing on clover, when pork is worth 6 cents, and when rent of land, taxes, labor, etc., are valued at \$10.00 per acre."

Rape, Oats and Clover.—This mixture was sown at the rate of 5 to 7 pounds of rape, $\frac{1}{2}$ bushel of oats, and 6 to 10 pounds of clover per acre. The results are summarized as follows: "A herd averaging 10 hogs per acre was pastured on rape, oats, and clover forage for an average of 96 days for the seasons of 1909 and 1910, and produced an average of 394 pounds of pork that could be accredited to each acre of forage eaten. A value of 89 cents may be obtained for every bushel of corn fed to hogs on rape, oats, and clover forage when pork is worth 6 cents per pound, and when rent, labor, taxes, etc., are valued at \$10.00 per acre."

Hogging Off Rye.—The authors state that when rye is intended for "hogging off" purposes it should be allowed to become thoroughly ripe, so that the heads crinkle down and droop near the ground. In three tests a supplementary ration of corn meal 6 parts and oil meal 1 part was fed at the rate of 1 pound per head per day. In two tests 16 hogs were pastured per acre, and in one test 8 hogs per acre. The amount of pork accredited to an acre of rye in the three tests was 215 pounds, 257 pounds, and 260 pounds respectively. With pork at 6 cents per pound the returns are accounted about equal to the returns when the crop is sold as grain but the fertility is retained under the pasturing system.

General Conclusions.—Of the general conclusions given in the bulletin, the following are of special importance:

1. "The number of hogs which may be kept on each acre of forage will depend upon the abundance of forage, but in general not more than 10 to 12 head should be used."
2. "The greatest returns have been obtained when grain was fed in addition to the forage at the rate of 2 to 3 per cent. of the weight of the hogs per day. The amount fed per head per day should be increased as the hog increases in size."
3. "A very good plan in feeding 80 to 100 pound hogs on forage would be to feed, per head per day during May, 1.75 pounds of grain; during June, 2 pounds grain; during July, 3 pounds grain, and during August, 4 to 5 pounds grain."
4. "Gains made on forage are made at 20 to 30 per cent. less cost than gains produced with grain and dry lot feeding. With pork at 6 cents the average value of a bushel of corn fed to hogs in dry lot was 66 cents; and the average value of a bushel of corn fed to hogs on forage was 80 cents, after a \$10.00 charge (per acre) had been paid for rent, taxes, etc."

Fall Rye.—Rye does not make so valuable a pasture as many other crops and its main feature is its early growth. For supplying pasture very early in the spring, a small plot of rye can often be used to good advantage.

Mixtures.—Various mixtures have been used as pasture crops for swine. The writer has used oats and peas, also a mixture of oats, peas, and vetches. These crops do not stand pasturing well, and are better suited for soiling purposes.

The Michigan Experiment Station speaks well of a mixture of corn, peas, oats, rape, and red clover. There is a good deal of waste in pasturing this crop. If, however, the first crop could be cut for soiling purposes, the second growth would furnish a good deal of pasture. (See also Missouri test reported in this center.)

Jerusalem Artichokes.—The Central Experimental Farm, Canada, reports good results from this crop. One-sixteenth of an acre was planted May 19th with 70 pounds of tubers. The tubers were planted about four inches deep, in

rows 12 inches apart, and in hills about 20 inches apart in the rows. Six pigs, averaging a little over 100 pounds each, were turned into the plot on October 3 and allowed to harvest the crop, which lasted them three weeks. They were fed a light meal ration while eating the tubers. The six pigs gained 197 pounds in three weeks, and consumed only 189 pounds of meal. This is a most extraordinary result, but it must be remembered that the experiment lasted a very short time. The experiment certainly indicates possibilities for this crop. Pigs eat artichokes very greedily.

Pasture vs. Soiling.—Some experiments at the Ontario Agricultural College indicate that more rapid gains with a smaller consumption of feed per pound of gain can be secured by soiling pigs than by pasturing. This is especially true of young pigs, and the writer's experience leads him to believe that pigs should weigh at least 100 pounds before being turned on pasture, to get best results. There is considerable extra labor in cutting green crops and carrying them to the pigs under the soiling system, which brings the two systems fairly close together from the stand-point of economy.

Amount of Grain on Pasture.—Growing or fattening pigs cannot be produced satisfactorily on pasture alone, but a grain ration is necessary. The Montana Experiment Station found that hogs fed a full grain ration on pasture gained on an average, 1.39 pounds per hog per day, and required 412 pounds of grain for 100 pounds of gain. Hogs fed a half ration of grain gained .98 pounds per hog per day, and required 291 pounds of grain for 100 pounds of gain. Thus, it was seen that the hogs fed a full ration on pasture made more rapid gains, but consumed much more grain for every 100 pounds of gain.

The Ontario Agricultural College fed two lots of pigs five weeks on clover and two weeks on rape. One lot received a full meal ration and the other a two-thirds meal ration. As in the Montana experiments, the hogs fed a full meal ration made more rapid gains than the others, but they consumed 421 pounds of meal for 100 pounds of gain, as compared with 353 pounds meal for 100 pounds in the lot fed the two-thirds ration.

It seems to be clearly demonstrated that it is a mistake to feed hogs all the meal they will eat when upon pasture, unless it becomes necessary to do so near the end of the feeding period in order to fit them for market. (See also Missouri recommendations.)

Methods of Feeding Alfalfa.—Bulletin 123 of the Nebraska Experiment Station reports a series of winter tests with varying proportions of corn and alfalfa. The tests covered three years, and they appear to have been carefully conducted.

Summary of Results.—(1) The gains made by the rations containing one-half alfalfa were much slower and more expensive than those obtained from any of the other rations. The tests during two winters showed that a fattening ration should contain less than half alfalfa, but a ration of half alfalfa and half corn was quite satisfactory for wintering brood sows.

When half the ration consisted of alfalfa, alfalfa meal gave faster gains than grain than chopped alfalfa, but the difference was not enough to pay for the cost of the alfalfa meal.

The average of four tests with 160 pigs showed that rations containing one-half alfalfa produced slower gains than a ration of corn alone, or of 9 parts of corn and 1 part of alfalfa. It would seem that a ration containing one-fourth

alfalfa is not as satisfactory for fattening hogs as a ration of corn alone, or a ration containing a larger proportion of corn and a smaller proportion of alfalfa.

(4) Alfalfa meal proved more satisfactory than chopped alfalfa when the ration consisted of one part of alfalfa to three parts of corn.

(5) In three tests with 90 pigs, a ration containing 9 parts of corn to 1 part of alfalfa proved more profitable than corn alone.

(6) When the alfalfa comprised only one-tenth of the ration, chopped alfalfa and alfalfa meal gave almost the same gains, but the chopped alfalfa proved more profitable owing to its lower cost.

(7) In three tests with 90 hogs, the feeding of corn with alfalfa hay in a rack gave very similar returns to feeding 9 parts of corn mixed with 1 part of chopped alfalfa, with the difference in favor of rack feeding.

(8) The results of 5 years' indicate that for fattening hogs the way to feed alfalfa most satisfactorily is to feed it without grinding or chopping.

(9) In these tests, 50 pounds of hay were worth more in the ration than a bushel of corn.

(10) The rations used in these tests are ranked in order of merit as follows:

- 1st. Corn and alfalfa hay in a rack.
- 2nd. 9 parts corn and 1 part chopped alfalfa.
- 3rd. 9 parts corn and 1 part alfalfa meal.
- 4th. Corn alone.
- 5th. 3 parts corn and 1 part alfalfa meal.
- 6th. 3 parts corn and 1 part chopped alfalfa.
- 7th. 1 part corn and 1 part chopped alfalfa.
- 8th. 1 part corn and 1 part alfalfa meal.

(11) It is recommended to feed the finest and brightest hay possible. Hogs will not eat the coarse stems.

ROOTS, POTATOES, PUMPKINS, APPLES AND DAIRY BY-PRODUCTS.

Roots.—In Henry's "Feeds and Feeding" there is an excellent summary of Danish experiments with roots for swine. The meal equivalent of roots was found to vary in a marked degree in different trials, and 100 pounds of barley were found to be equivalent to 600 to 800 pounds of mangels and 400 to 800 pounds of stock beets. In the United States and Canada, wide variations in the meal equivalent of roots have also occurred in various tests. The following table gives an idea of the range of values found at several stations:

MEAL EQUIVALENT OF ROOTS.

Central Experimental Farm	100 pounds meal = 786 pounds roots
Ohio Experiment Station	100 pounds meal = 642.5 pounds roots
Montana Experiment Station	100 pounds meal = 529 pounds roots
Utah Experiment Station	100 pounds meal = 455 pounds roots
Ontario Agricultural College	100 pounds meal = 441.5 pounds roots
Average	100 pounds meal = 570.8 pounds roots

The variations in these trials are similar to the variations in the Danish experiments. Ontario obtained a remarkably high meal equivalent for roots, and

it is of note that in the Ontario trials the roots were pulped and mixed with an equal weight of meal, the hogs being fed all they would eat of the mixture.

In the writer's experience, hogs fed roots are thriftier looking and possess better appetites than hogs fed meal alone, and it is no doubt due to their influence on the general health of the animal that roots are able to make such a favorable showing. The degree to which the general thrift of the animals is injured by meal feeding will be reflected in the relative feeding value shown by roots and grain, and this fact renders extreme variations quite possible.

Generally speaking, it may be said that sugar beets possess the highest feeding value among ordinary roots, and are most readily eaten by swine. Mangels, Swedes and carrots may be counted practically equal in value, but hogs eat mangels with greater relish than they eat turnips.

Potatoes.—At the Wisconsin Experiment Station, 441 pounds of potatoes, when fed to swine, proved equal to 100 pounds of cornmeal. In "Feeds and Feeding" Henry summarizes experiments, where 400 pounds of potatoes proved equal to 100 pounds of mixed meal. In connection with these investigations, Prof. Henry says: "In general, we may say that a bushel of corn is worth four and one-half bushels of potatoes for fattening purposes when cooked and fed with meal. Potatoes may have a higher value than the rating here given, in furnishing variety in ration to growing animals."

Potatoes must be cooked for swine, and this item of expense cancels some of the advantage which they possess over roots as a feed for swine.

Pumpkins and Squashes.—Pumpkins belong to the same class of feeds as roots, giving bulk and succulence to the ration and thus promoting thrift. J. H. Goodale, Central Experimental Farm, has a high opinion of pumpkins for swine. He says: "We cook them and mix meal with them, and I don't think there is anything that will surpass them as a cheap fattening ration." He also states that the pigs like the seeds best, and that no injury comes from feeding the seeds. Excellent results were obtained at the New Hampshire Experiment Station from feeding raw pumpkins, with meal and skim-milk.

The Oregon Experiment Station found that a 200-pound hog consuming 26 pounds of cooked pumpkin and a small amount of shorts gained 1.2 pounds per day. Other investigators have found that 273 pounds of grain and 376 pounds of raw pumpkin produced 100 pounds of pork. Some experiments show that cooking pumpkins does not add to their value.

The squash may be counted as equal to the pumpkin in feeding value.

Apples.—Apples do not appear to possess a high feeding value, but may often be used to good advantage to give variety and succulence to a ration. They are perhaps most suitable for mature breeding stock, but a hog should never be expected to subsist upon apples as the main part of its ration.

Skim-Milk.—The results of nineteen trials with eighty-eight pigs at the Wisconsin Experiment Station are well summarized by Henry in "Feeds and Feeding." It is a well-known fact that when a small proportion of skim-milk is fed with meal, the milk shows a higher meal equivalent than when a large proportion is fed: that is to say, it requires a smaller amount of skim-milk to be equal to a given amount of meal when a small proportion of milk to meal is used. Henry summarizes the Wisconsin results as follows:

MEAL EQUIVALENTS OF SKIM-MILK.

Proportion of Milk to Meal	Pounds of Milk Equivalent to 100 Pounds Meal
1 lb. corn meal, 1 to 3 lbs. milk.....	327 lbs. milk = 100 lbs. meal
1 lb. corn meal, 3 to 5 lbs. milk.....	446 lbs. milk = 100 lbs. meal
1 lb. corn meal, 5 to 7 lbs. milk.....	574 lbs. milk = 100 lbs. meal
1 lb. corn meal, 7 to 9 lbs. milk.....	562 lbs. milk = 100 lbs. meal
Average of 19 trials.....	475 lbs. milk = 100 lbs. meal

The Ontario Agricultural College reports a trial in which 355.6 pounds of skim-milk proved equal to 100 pounds of meal. The proportion of milk to meal was about 2.5 to 1, and the result is similar to the Wisconsin result with a similar proportion of milk to meal.

The Minnesota Experiment Station reports six trials in which the proportion of milk to meal varied, the highest proportion being about five pounds of milk to one of meal. The average of these trials gives 467 pounds of milk, equivalent to 100 pounds of meal, which is very close to the Wisconsin average.

Utah experiments show 431 pounds of skim-milk equal to 100 pounds of grain, and Tennessee experiments, 476 pounds of skim-milk equal to 100 pounds of grain. The Tennessee results are practically identical with the Wisconsin average, and the Utah results are reasonably close.

These experiments show that, where skim-milk can be obtained conveniently and in suitable quantity, it has a very considerable value in hog-feeding. When meal is worth \$20 per ton, skim-milk is easily worth 20 cents per hundred pounds, unless an exceptional amount of labor is involved in procuring it. For young pigs just after weaning, however, its value is very much higher than for older hogs.

Sweet vs. Sour Skim-Milk.—Several experiments with sweet and sour skim-milk indicate that there is little or no difference in the feeding value of the two products,—in fact, the sour milk has, if anything, had the advantage. For very young pigs sweet milk is preferable.

Whey.—At the Ontario Agricultural College, the writer conducted seven trials with a view to ascertaining the value of whey for pig feeding. The average of these seven trials gives 744.5 pounds of whey, equivalent to 100 pounds of meal.

Two trials at the Wisconsin Experiment Station gives an average of 800 pounds of whey, equivalent to 100 pounds of meal.

These trials probably show the maximum value of whey for pig feeding. Under ordinary methods of feeding it would hardly be safe to expect quite as good returns for whey. Where labor is involved in procuring the whey, due allowance must be made in estimating the value of this product.

Sweet vs. Sour Whey.—Five trials made by the writer failed to show any appreciable difference between the feeding value of sweet and sour whey.

Separated vs. Ordinary Whey.—In an experiment conducted by the writer, ordinary whey proved to be worth twenty-five per cent. more than separated whey. The separated whey had been run through the cream separator to remove the fat for making whey butter.

Buttermilk.—Experiments at the Ontario Agricultural College and elsewhere show that buttermilk is practically equal to skim-milk for feeding purposes.

Substitutes for Skim-Milk.—For young pigs, just after weaning, it is difficult to find anything that will take the place of skim-milk. When skim-milk is not available, there is danger of the pigs becoming stunted at this period of their life, especially pigs that are weaned young. The Ontario Agricultural College conducted two trials with Swift's digester tankage and blood meal as substitutes for skim-milk. These two feeds proved nearly equal in value, and, since the tankage costs much less per ton, it was regarded as the more satisfactory.

In the first trial the tankage constituted about one-fourteenth of the total ration, and in the second trial one-tenth of the total ration.

About two pounds of milk to one pound of meal were fed in each trial.

The average of the two trials shows that to produce 100 pounds of gain it required:

375 pounds meal and 34 pounds tankage.

100 pounds meal and 727 pounds skim-milk.

The pigs getting tankage ate their feed quite as eagerly as those getting skim-milk, and continued thrifty throughout the experiment.

Tankage, therefore, proved a very satisfactory substitute, as far as gains in weight were concerned, but, when skim-milk can be obtained at 15 cents per hundred weight, it is cheaper than tankage at prevailing prices, according to this test.

In a second trial, tankage made by the Harris Abattoir Co., of Toronto, was compared with skim-milk for young pigs. The tankage was fed in proportion of one pound of tankage to six pounds of meal. The tankage pigs made an average gain of 1.02 pounds per pig per day, the skim-milk group, 0.93 pounds, and the meal group, on meal only, 0.74 pounds. Placing a value of \$22 per ton on the meal, and that in this test the skim-milk was worth 27 cents per 100 pounds, and the tankage, \$2.92 per 100 pounds. This test, therefore, like the preceding one, shows that it is economical to furnish young pigs with feed rich in protein, and it is good practice to use a feed like tankage when skim-milk is not available. It also goes to show that young pigs can be raised economically without skim-milk.

In other experiments by the writer, the results of which have not been published, other substances, such as linseed meal, "black-strap" molasses, and tea from a hay, have been tried, but none of these approached tankage in efficiency as a substitute for skim-milk for young pigs.

The Michigan Experiment Station also compared tankage with skim-milk for young pigs. The pigs on skim-milk made slightly larger gains, but, when skim-milk was valued at 20 cents per 100 pounds, and tankage at \$1.62½ per 100 pounds, the tankage-fed pigs made cheaper gains than the skim-milk pigs.

PREPARATION OF FEED.

Cooking and Steaming.—Years ago there was a popular belief that cooking and steaming feed increased its digestibility, and hence its feeding value. The work of experiment stations and private investigators has thoroughly exploded this belief and indicates that digestibility may be decreased rather than increased in the case of many feeds. There are some feeds which are rendered more digestible by cooking, such as potatoes and beans, but in the case of feeds eaten readily without cooking, it may be taken as settled that cooking is poor economy. Instead of being a commendable practice, cooking is a practice which should be avoided as far as circumstances will permit, and only when feeds are not acceptable in the raw state. Where economy

is no object, it may be possible to secure larger gains in weight by cooking a certain portion of the feed to make the ration more palatable, thus stimulating the appetite of the animal, but such gains are usually obtained at a comparative high cost.

Grinding.—The question of grinding was discussed, under corn, and it was shown that, so far as corn is concerned, the gain from grinding is comparatively small. Numerous experiments have been made with other grains to determine the effect of grinding, it being generally supposed that grinding would be more effective in the case of small grains than it would be with corn. It is out of the question to review experimental work in detail in regard to this point, but it may be said that grinding small grains, such as peas, barley, oats, and rye, has almost invariably proved beneficial. Sometimes the advantage of the ground grain has been very slight, and sometimes very marked, but the general evidence indicates that it is advisable, when practicable, to grind such grains. When the cost of grinding is excessively high, the practice may not be advisable, but, under ordinary circumstances, it is the safe course. According to a compilation of experiment station results, made by G. M. Rommel (Bulletin 47, U. S. Dept. of Agr.), the average saving effected by grinding small grains is 12.26 per cent.

Wet vs. Dry Feed.—Considerable experimental work has been done with wet and dry feed, and results are very contradictory. On an average, the two methods of feeding show practically equal results. The writer's experience is that when hogs can be fed dry meal in such a manner that they cannot waste it, they make as good use of it as when it is wet. There is more tendency to waste feed when it is fed dry, especially when a considerable number of hogs are fed out of the same trough. Troughs arranged so as to prevent crowding will tend to lessen the waste. In cold pens, dry meal feeding has some advantages, and mixing dry meal with an equal weight of pulped roots makes a good ration. Under ordinary conditions, it is difficult to see much advantage from dry feeding.

Soaking.—Soaking feed is another practice which seems to give variable results, according to experimental data. There seems little doubt, however, that, in the case of dry hard grain fed whole, soaking is to be commended. In the case of meal, freshly mixed feed will likely give as good results as soaked feed.

Fermenting.—The practice of fermenting feed for swine was formerly much more common than it is at present. In the case of cotton-seed meal, the Texas station recommends mixing the cotton-seed meal with other meal, and allow the whole mass to sour. The New Hampshire Station obtained better results from fermented bran than from unfermented bran. With feeds well adapted to pig feeding, it is not likely that fermentation would be of any benefit.

METHODS OF FEEDING.

"Hog Motor Grinder" vs. "Hopper."—The Maryland Experiment Station (Bulletin 150) reports tests with the "hog motor grinder," a contrivance by means of which hogs grind their own grains as they require it. The grinder was compared with a self-feed hopper. In the first test whole corn was used in the hopper, and in the second test ground corn was used. The pigs were from four to five months old at the commencement of the experiment.

In the first test the hopper-fed pigs made an average daily gain per pig of 1.85 pounds, and the grinder-fed pigs 1.65 pounds.

feed consumed per 100 pounds gain was as follows: Hopper pigs.—Corn, 224 pounds; middlings, 68 pounds; milk, 339 pounds. Grinder pigs.—Corn, 224 pounds; middlings, 76 pounds; milk, 385 pounds.

In the second test the hopper-fed pigs made an average daily gain per pig of 2.11 pounds, and the grinder-fed pigs, 1.86 pounds.

Feed consumed per 100 pounds gain in the second test was: Hopper pigs.—Corn, 287 pounds; middlings, 71 pounds. Grinder pigs.—Corn, 273 pounds; middlings, 80 pounds.

The author of the bulletin states: "The hog motor grinder and feeder gave good results in two tests. However, when used in comparison with hopper feeding of shelled corn and cornmeal, the margin of profit was in favor of the hopper-fed."

Hopper Feeding vs. Trough Feeding.—The bulletin referred to above also reports two tests in which the self-feed hopper was compared with trough feeding. In the first test 10 five-months-old pigs were used, and in the second test 10 pigs about three and one-half months old were used.

In the first test all the pigs were fed a mixture of ground corn, wheat middlings, and meal; and in the second test, hominy chop and middlings. In each test dry meal was fed in the hoppers, and wet meal in the troughs.

The results of the two tests were as follows:—

First Test: Hopper fed.—Average daily gain per pig, .71 pound. Meal consumed per 100 pounds gain, 520 pounds. Trough fed.—Average daily gain per pig, 1.36 pounds. Meal consumed per 100 pounds gain, 348 pounds.

Second Test: Hopper fed.—Average daily gain per pig, 1.26 pounds. Meal consumed per 100 pounds gain, 387 pounds. Trough fed.—Average daily gain per pig, 1.36 pounds. Meal consumed per 100 pounds gain, 348 pounds.

It will be seen that in both tests the trough-fed pigs made more rapid and heavy gains than those fed from hoppers, though there is less labor when hoppers are used.

PART IV.

SELECTION, FEEDING AND MANAGEMENT.

THE BOAR.

Selection.—In these days, when pure-bred males are plentiful and reasonable in price, there is practically no excuse for using anything but a pure-bred boar, although the sows be merely grades. The pure-bred male will transmit his qualities to his progeny with greater certainty than a grade or cross-bred, and will get pigs of more uniform quality and excellence, so that it pays to use a pure-bred boar even for producing market hogs. It is true that many pure-bred boars would not be used for breeding, but this affords no reason for using a grade boar. A "scrub" pure-bred should be rejected along with the grade and cross-bred. If there are reasonably good pure-bred boars always available to the man who wishes to make an effort to get one.

When selecting a boar to head a pure-bred herd, it will not do to be too particular regarding price. This does not mean that we are to pay fancy prices, running into the thousands, such as we sometimes read about; but it is well to

bear in mind that a boar which is not good enough to command a fair price is seldom good enough to put at the head of a pure-bred herd. The importation of the herd will determine the price which the owner can afford to pay for but a few extra dollars on the price of a boar is a small matter when it is of securing something that the breeder really needs. The mere size of the boar, however, is not a safe criterion of the merit of the boar, but it rests with the breeder who makes the selection to see that he gets value for his money. It is not surprising that a wide experience and a seasoned judgment count for so much in boar breeding. Sometimes aged boars, which have proved their excellence as sires and getters, are to be had at a very reasonable price, and if they are still active they are much safer to buy than young, untried boars. There is much unreasonable prejudice against aged boars, and many an excellent aged boar is sent to the butcher long before his usefulness is past merely because no person would buy him for breeding purposes; and young boars, many of which should have gone to the butcher before being used at all, are taken in preference. These things are matters of judgment, and to select wisely the breeder must know what he requires.

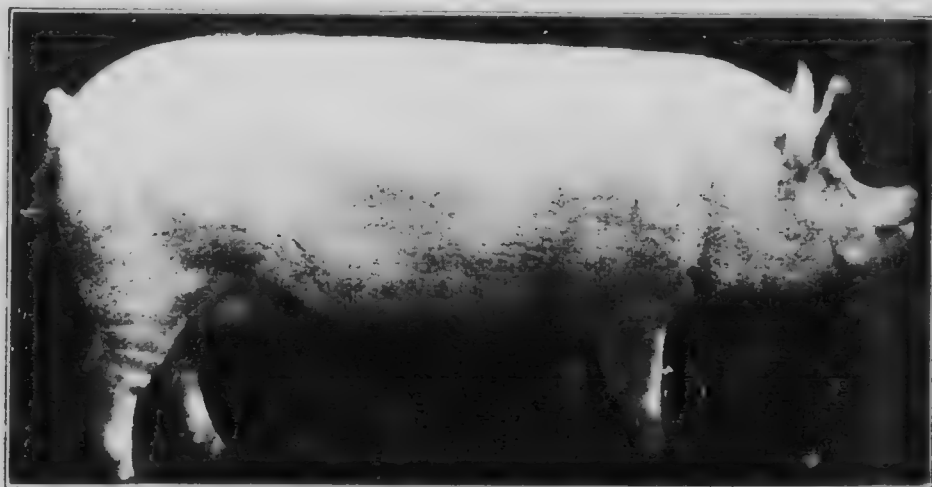


Fig. 6. Large Yorkshire boar; an English Royal Show winner.

When buying a young boar, it will be found safer to buy one from twelve months old than a pig two or three months old. The reason for this recommendation is plain, it being impossible to foretell just how the very young pig is going to develop. Highly-fitted show boars had better be avoided. It is more satisfactory to select by personal inspection than to buy through correspondence. A visit to the herd which produced the boar enables one to judge the general quality of the hogs produced in the herd, and one can pick up information concerning the sire and dam that could not otherwise be obtained.

If the boar is shipped some distance and arrives excited and tired, he should be fed very lightly at first, and not used for several weeks after his arrival.

The desirable conformation of the boar will depend upon whether he belongs to the fat type or the bacon type, and will also be influenced, more or less, by the breed to which he belongs. The general type of the fat hog and the bacon hog is discussed in another place, but it may be said that we expect a boar to be different in the head and to possess a more muscular neck, more massive shoulder, and heavier bone, than a sow or barrow. He should conform to the best type of the

which he belongs, and should have a bold, impressive carriage and general appearance. There should be nothing effeminate about his appearance and general coarseness and roughness are not desirable, but if it came to a choice between two boars, one of which was fine and effeminate and the other inclining to coarseness, but strongly masculine, the writer's experience would lead him to select the latter, other things being equal.

The age at which a young boar may be first used depends largely upon management. Some boars may be used to a few sows when not more than eight months old without apparent injury. As a rule, it is safer not to use a boar until he is eight months old, and to use him as sparingly as possible until he is a year old. No hard and fast rule can be laid down, and the owner must use his judgment in the matter. Excessive use when young is likely to shorten the period of usefulness, and, since a boar will usually leave the best pigs after he is mature, the importance of saving him while he is young will be readily



Fig. 7. Berkshire boar, championship winner at the Iowa State Fair.

Some good breeders will not allow more than one service a day, with one or two days a week without being used in the case of valuable boars. This is a matter which can be regulated better in large herds, where several boars are kept, than it can where only one boar is kept and where outside service is limited. The owner of a boar under the last named conditions will exercise all his ingenuity to prevent his boar from being used too freely during the main seasons of the year. In no case should more than one service be permitted, and the boar should not be allowed to run with sows to which he is not bred. Excessive use is likely to result in small, weak litters, and the owner should be to save the boar as much as possible. It is not good to use a boar after he has been fed.

Exercise.—Probably nothing is more essential to the health and vigor of an animal than exercise. In summer it is usually a comparatively simple matter to exercise a boar in a paddock or pasture lot, but in winter it is more difficult. A

roomy pen should be provided, with a sheltered outside yard. When practicable, it is a good plan to feed the boar outdoors at some distance from his sleeping quarters, thus compelling him to take exercise in walking back and forth between his pen and the feeding place. Dry ground is the greatest drawback to this method, but this can be overcome by littering the walk with some strawy horse manure. Sometimes the boar can be fed in a well-littered barnyard, which makes a very good arrangement when practicable.

When several boars are kept, it is difficult to provide separate runs for each boar, and it simplifies matters if they are taught to run together. The tusks should be removed, and a cool day should be selected for turning them together for the first time. It takes a very short time, as a rule, to settle the question of supremacy, and when once settled no further disputes arise. The writer has had considerable experience with this method, and has never known bad results to follow. The two mentioned conditions are necessary—namely, the tusks must be broken off and a cool day selected for the tournament. After the first struggle the boars will live together as peaceably as sows.

Removing Tusks.—Armed with long, sharp tusks, the boar is capable of inflicting serious injury upon man or beast should he take the notion, but deprived of his tusks he becomes comparatively harmless. It is the part of wisdom, therefore, to remove these tusks before any damage is done, because we never know what the quietest boar may do under provocation. Several methods may be employed, and the following one will answer very well: The boar is first made fast to a post by means of a rope noosed about his upper jaw back of the upper tusks. Then one man takes a crowbar and another a sharp cold chisel and a hammer. The sharp edge of the crowbar is placed against the tusk near its base and held firmly in position, and the edge of the cold chisel is placed on the opposite side of the tusk directly opposite to the edge of the crowbar. A sharp blow with the hammer on the cold chisel does the job.

Feeding.—It requires good judgment to keep a boar in the best possible condition. Extremes are to be avoided. The over-fat boar does not make a satisfactory sire, as a rule, and a half-starved boar cannot transmit vigor and constitution to his progeny to the same degree that he would if properly managed. To get the best results the boar should be in fair flesh. A reasonable amount of fat on his bones will do him no harm if he gets sufficient exercise.

An exclusive meal ration will not give good results, especially if the ration is made up of corn. It is true that corn can be fed to a boar without injuring him, but it must be fed in the right way. Corn is fattening, but its exclusive use is debilitating, and the feeder must combine something with it to get good results. Equal parts ground oats and wheat middlings make a first-class meal ration when corn is not used. It gives sufficient bulk, and is nutritious without being heating or too fattening. Ground oats, middlings, or bran may be used singly to dilute corn or other heavy meal; in fact a very great variety of grains may be fed so long as the feeder uses judgment.

Supplemental Feeds.—But a boar needs something besides grain and meal to be in his best condition. Skim-milk and buttermilk are excellent, and will give good results with meal even if nothing else is used. In winter roots of any kind are much relished. They have a cooling, laxative effect, preventing constipation and keeping the animal thrifty and vigorous. If roots are not available, alfalfa hay of fine quality or even red clover may be used to give bulk to the ration. Some feed the alfalfa hay dry in racks, and others prefer to cut it and soak it with the

meal or scald it with boiling water before mixing with the meal. As a substitute for roots, the soaked or steeped alfalfa would be preferable to the dry hay. Alfalfa or clover hay may be fed along with roots, and will be found to give good results. The feeder takes care to supply a reasonable amount of concentrated feed to make the ration sufficiently nourishing.

Summer management is usually simpler than winter. A pasture lot provided with shade is one of the best places to keep a boar. The grass or clover, or whatever the pasture may consist of, will furnish the bulky, succulent feed necessary for growth, and gathering part of his food from pasture compels the boar to take exercise. If it is not possible to provide the pasture, he should be liberally supplied with corn feed in his pen.

The quantity of meal to feed a boar will vary with circumstances. During the season when he is used most, he will require liberal treatment, but at no time should he be fed more than he will eat up clean before leaving the trough. During

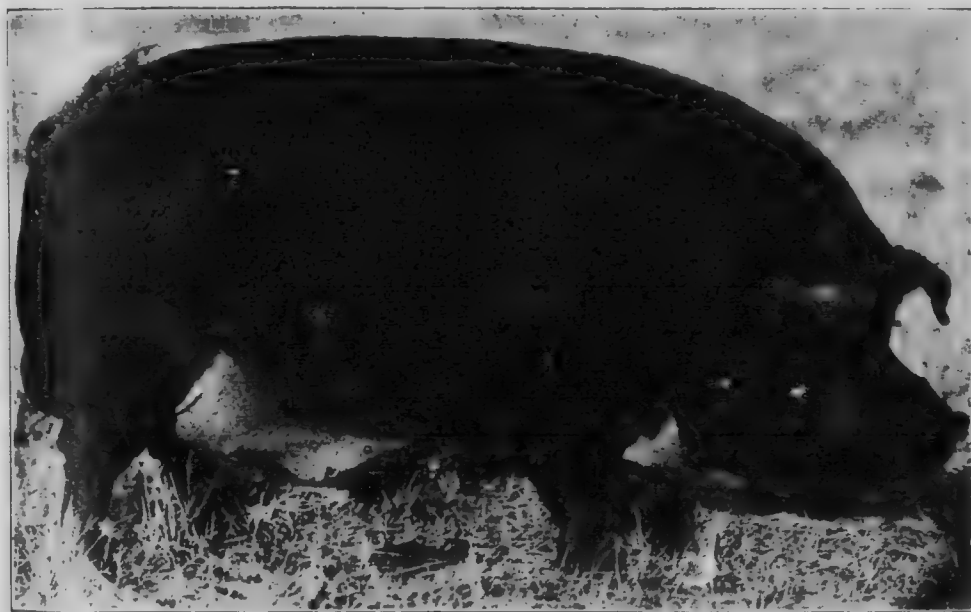


Fig. 8.—Duroc-Jersey boar, championship winner at Iowa State Fair.

comparatively idle seasons a very light meal ration will be sufficient, and if on good days he will require but little feed in addition. It is entirely a matter of judgment, and the feeder must be guided by the condition of the boar. It is never wise to make sudden changes in the ration—that is, to change suddenly from a light to a heavy one, or from a heavy ration to a light one. Changes should be made gradually, and the feeder, knowing about when the heaviest season commences, should allow plenty of time to prepare the boar for it.

B. Breeding Crate.—When it is necessary to breed heavy boars to rather small sows, a breeding crate often can be used to advantage. There are many types of crates, but the one shown in the illustration is easily made, and will serve its purpose very well.

The dimensions of the crate are: Length, 5' 6"; width, 2', and height, 3' 6". The posts at the corners are made of 2" x 4" scantling, and the sides may be

made of 4" strips of inch lumber, with a 10" board at the bottom on each side. The supports for the feet of the boar (AA) are hinged at the front end of the crate, and can be raised or lowered by means of the chains (B). On the outside of the crate are hooks for holding the chains. "C" is an iron rod which slips through holes (D) bored in the bottom side boards of the crate. The rod should come just above the hocks of the sow, and there should be enough holes to permit adjusting the rod to the size of the sow. If it is desired to use a small boar on a large sow, the crate may be made to answer the purpose by simply placing a cleated sloping platform at the rear of the crate.

THE SOW.

Selection.—For the production of market hogs it is not essential that a sow should be pure-bred. A grade sow of good type and parentage will usually produce very satisfactory pigs for market purposes, if mated with a boar of good breeding and quality, but, of course, none of her boar pigs should be kept for breeding purposes.

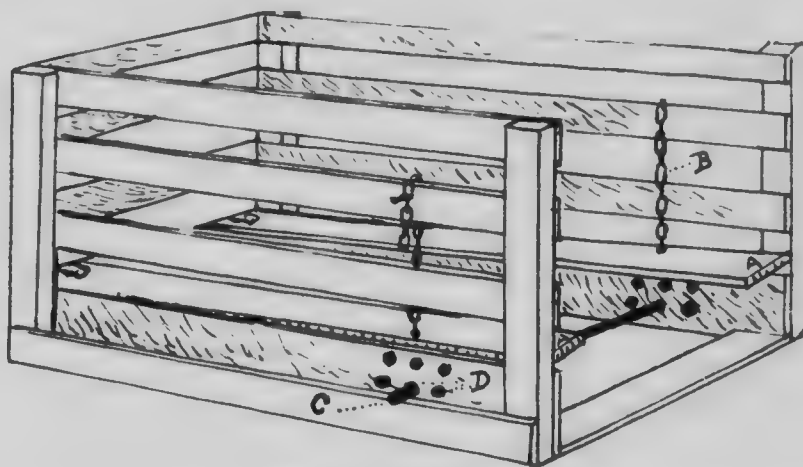


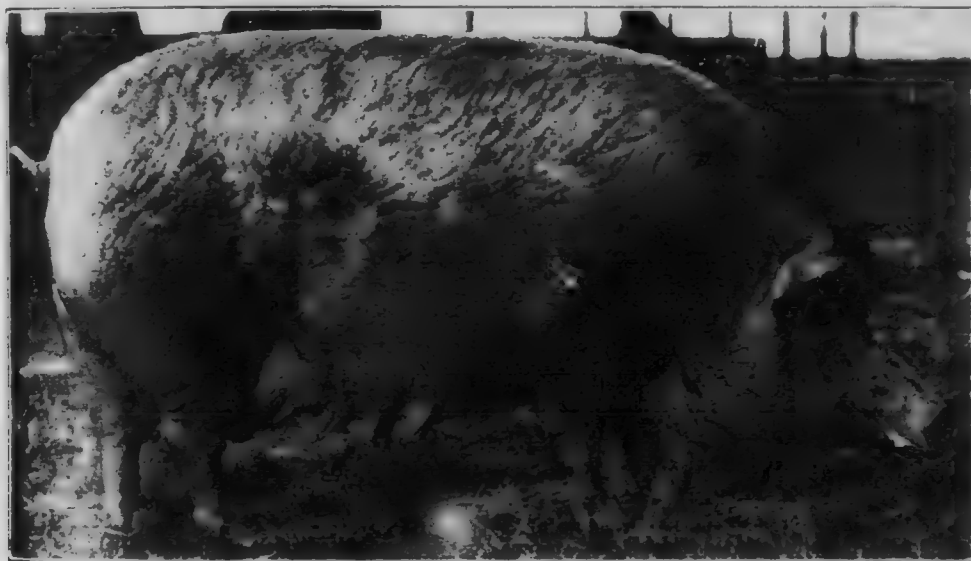
Fig. 9.—Breeding crate.

Whether pure-bred or grade, a sow selected for breeding should be from a prolific mother, and by a boar that comes of a prolific family, because fecundity is hereditary to a very high degree. It is safest to select a sow from a matured mother who has had a chance to demonstrate her usefulness. In making a selection, the number and character of the teats should be noted. A sow is more likely to make a good mother if she has at least twelve well-developed teats, set well apart, and the front ones well forward on the body.

In character, the sow is directly the opposite of the boar, and there is a femininity about her general appearance and bearing which indicates the prolific and indulgent mother.

When a really good sow is once obtained, she should be kept in the herd as long as she retains her usefulness. A really first-class sow is not too easily obtained, and when once acquired it will be found the part of wisdom to keep her as long as she continues to produce satisfactory litters.

Age of Breeding.—The age at which a young sow is first bred will depend upon her development, but it is very seldom that it is advisable to breed her before she is six months old. Many good breeders prefer not to breed sows before they are even twelve months old, and if they are intended for show purposes it is scarcely advisable to breed them earlier. One of the great objections to breeding early is the fact that the very young sow is seldom able to raise a fair number of pigs, and if she raises only a few pigs in her first litter her mammary glands do not develop properly, and she rarely makes as good a nurse with subsequent litters as the sow which raises a good-sized first litter. Another objection to early breeding is the fact that the very young sow has not the strength to stand the strain of nursing a litter of pigs, and her vitality is sapped to such a degree that she does not develop as she should. As a result, she will not retain her usefulness for so long a period, nor is she so likely to give strong, vigorous litters as though she had possessed more maturity before being bred.



10.—Tamworth sow, winner of championship at the English Royal Show.

Breeding Mature Sows.—Many sows will accept service a few days after farrowing, but it is hardly necessary to say that to breed a sow at this time is bad practice. No sow can do justice to herself and two litters of pigs at the same time, and a man who attempts to gain time by following such a practice will surely lose in the end. Usually the sow may be bred again a few days after her pigs are weaned, if not much pulled down in condition by nursing. If she has raised a large litter and is much emaciated, the chances are that she will produce a small litter the next time if she is bred immediately after the pigs are weaned. In such cases she should be given three weeks or a month of liberal feeding to enable her to regain some of her lost strength and vitality before she is bred. Although the sow need not be fat, she should be in good heart and thriving at the time she is bred. Many a man has been puzzled to know why his sow, which had raised a large litter, should drop down to four or five pigs the next time. The

reason is not difficult to find, because a sow must be strong and full of vigor at the time of service in order to produce a large, vigorous litter.

Period of Gestation.—The period of gestation in sows is usually placed at 112 days. Often, young sows will farrow a few days sooner than the stated time and old sows will frequently go a few days over it. It is not a good sign when a sow goes much over the sixteen weeks, as the litters are often lacking in vitality when carried much over time. If a sow has been properly handled, she will seldom go more than a few days over sixteen weeks, though there are exceptions to all rules.

Best Times for Farrowing.—Where winters are at all severe, it requires exceptional skill and equipment to make a success of winter litters. Most farmers will find it safer to have their sows farrow in April and October. It is generally possible to give April pigs a little outdoor exercise at an early stage of their growth, which will be found a great help in keeping them healthy and thrifty. The October pigs will also be able to get outdoor exercise for a time, which will enable them to



Fig. 11.—Tamworth sow, a prize winner at leading Canadian shows.

get a good start and make them better able to endure the closer confinement necessary during winter.

One or Two Litters.—The man who is breeding for show purposes, and who wishes to have his pigs with the sow as long as possible, as well as get his sows into high condition between litters, will find it necessary to breed his sows only once a year; but the general practice of farmers is to require their sows to do more than this. There is no good reason why a sow should not produce two litters a year when properly handled, provided that the sow is not to be fitted for the show ring.

Exercise.—Though exercise is important in the case of the boar, it is doubly important with sows during the period of gestation. Without considerable exercise during this time, sows cannot be made to give satisfactory results. In summer, pasture should be provided in which there is plenty of shade. A good pasture affords ideal conditions for sows, the green feed and the exercise keeping the sows in the best possible condition.

Winter Exercise and Quarters.—The greatest difficulty will be in giving the sows sufficient exercise during the winter. Where only a few are kept, it is often possible to give them the run of a barnyard, where they exercise rooting in the manure, or working in scattered straw or chaff to little grain it may contain. If a dry, well-bedded sleeping-place is provided, and is free from draughts, the conditions are about as good as can be

obtained. If it is impossible to use the barnyard, a roomy shed with earth floor, and a sleeping-place arranged in one corner, can be made to answer the purpose very well. By littering the shed with cut straw or chaff and sprinkling a very little water in the chaff every day, the attendant can induce the sows to take considerable exercise. Another method is to use portable pens set in outside lots. The pens should be placed facing the south, and fifty yards or more from the feeding-

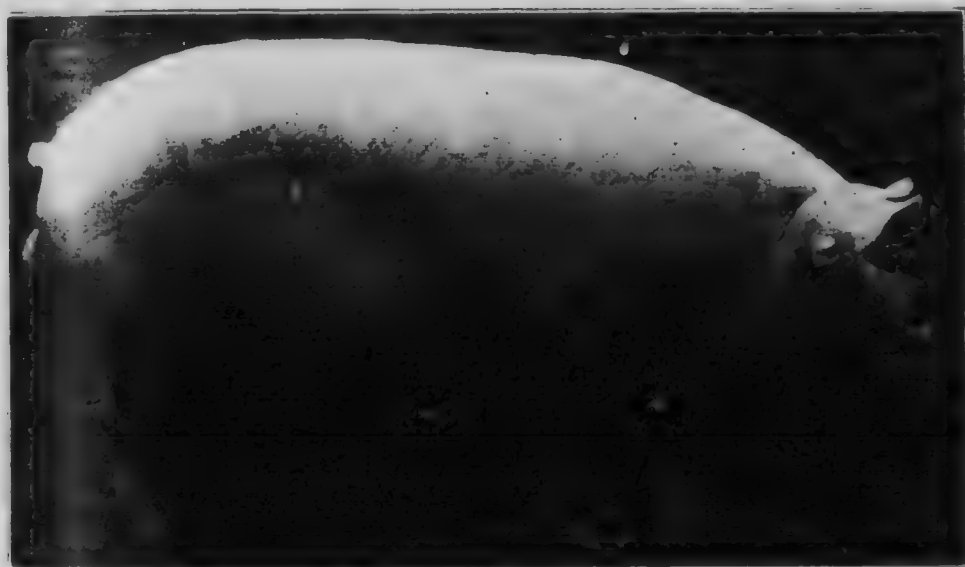


FIG. 1. Large Yorkshire sow, championship winner at the English Royal Show.

place should be kept well bedded, and banked about the bottom with strawy horse manure. The sows are forced to take exercise in comfortable sleeping quarters. The sows are forced to take exercise in backwards and forwards between the pen and the feeding place. It is better to keep not more than five or six sows in a pen of this kind, and the pens should be taken to provide plenty of rough room. The troughs should be placed on dry ground, or on a platform, and it is preferable to have them in a place sheltered from the wind. (See under "Portable Pens," Part VI.)

Feeding and Management during Gestation.—During the period of gestation the sow should be kept in good, strong condition, but not overloaded. Extremes in condition are to be avoided. The very fat sow is apt to be sluggish with her pigs, and sometimes her pigs are few in number or lacking in vitality. On the other hand, the very thin sow will either not do justice to her food, or will become a mere wreck herself during the time she is nursing her litter. The chances are that both these things will happen. A sow may be kept in

fairly high condition and will produce satisfactory litters, provided she takes plenty of exercise.

In districts where corn is plentiful, there is a temptation to feed almost exclusively upon corn. Such a method of feeding cannot give the best results because corn does not furnish enough bone and muscle-forming constituents to properly develop the unborn pigs. It is also rather too fattening and heating to feed in large quantities to a sow at this stage. It is true that corn may be fed, but, as in the case of the boar, it must be fed with judgment. The ration recommended for the boar—namely, equal parts ground oats, and wheat middlings—will answer very nicely for the sow. The proportion of corn, if fed, should not be over one-third of the meal ration, and wheat middlings or bran may be used to dilute the corn meal without oats. In cold weather, if sows have a good deal of outdoor exercise, they may be fed more corn with safety than when they are kept pretty closely confined.



Fig. 13.—Champion Berkshire sow at the Iowa State Fair.

A meal ration which is preferred by the writer to all others is equal parts ground oats and middlings, leaving out corn altogether. It is possible, however, to use a wide variety of feeds, so long as the feeder realizes the importance of furnishing considerable bulk and of restricting the proportion of heating or highly fattening feeds.

As in the case of the boar, the sow requires something besides meal, and the furnishing of some such feeds as roots, or alfalfa, or red clover hay, is even more important than in feeding the boar. Skim-milk is also excellent but is not always available for sows.

In summer, a pasture field will furnish the bulky part of the ration, and if sows are in good condition to start with and are given a good pasture, they will get along very well without other feed for two or three months. They should be given a little meal for several weeks before farrowing, to accustom them to its use and render the change less violent when they are taken into the pens. With regard to

ty of meal, the feeder must be guided entirely by the condition of the

Meal may be fed either wet or dry. When roots are fed, a good plan is to mix the meal with pulped roots, though the feeder has wide latitude in regard to the method he may see fit to follow.

In Cold Weather, when sows are fed out-doors, very little water should be used in their feed. It will be found better to furnish them with water separately, should they require it. If they are fed roots, they will take very little water in cold weather. It should be seen to, however, that they have water when they need it, and in hot weather an abundant supply of fresh water is very important.

A record should be kept of the date of service of each sow, so that the date of farrowing will be known in advance, and due precaution taken. A week or two



14.—Large type Berkshire sow, representing the type popular in Canada.

Before farrowing, the sow should be placed in the farrowing pen, so as to become accustomed to her surroundings and changed conditions before the pigs are born.

Constipation is the bane of the swine breeder, and if the sow becomes constipated before she farrows, the chances are that she will lose her pigs, and possibly her life. Constipation, therefore, is one of the main things to be guarded against at this time. When it once occurs, very little can be done to overcome it before the pigs, so that it is almost altogether a matter of prevention. If a sow is taken directly from a pasture field, shut up in a pen, and fed upon an exclusive meal ration, trouble is almost sure to occur. Radical changes in feeding are to be avoided, and the ration should be kept practically the same after taking the sow into the farrowing pen as it was before. If anything, the feed should be made rather more liberal. The green feed or roots should be supplied the same as they were before she was taken in. A small amount of linseed meal (oil meal) or ground flaxseed added to the ration is also helpful in preventing constipation. The wisdom

of feeding meal to sows while on pasture for a time before they farrow can be readily appreciated, as it prevents a violent change in their ration. The sow should also be given a chance and encouraged to take exercise.

Farrowing.—The farrowing pen should be dry, well ventilated, and free from draughts. It is a good plan to provide the pen with a guard rail made of two by eight inch planks fastened with their edges against the sides of the pen a little above the bed. These prevent the sow from lying against the partition, and lessen the danger of injury to the little pigs, which often find the space under the guard a very convenient refuge.

There is a difference of opinion as to the amount of bedding which should be used, some maintaining that the sow should be liberally supplied with bedding, and others that the bedding should be limited. The writer's experience is that active sows in comparatively light condition can generally be trusted with a liberal



Fig. 15.—Chester White sow, a prize winner at American shows.

amount of bedding, but sows which are in high condition, or which are at all clumsy, had better be given only a moderate amount of cut straw.

Sows should not be allowed to farrow in a large piggery where many other pigs are kept, unless it is warm weather and windows and doors can be left open. The air of a piggery where many pigs are kept seems to be poisonous to little pigs, when the weather is cold and the doors and windows have to be kept closed, in spite of ordinarily good methods of ventilation.

The writer has had good results from sows farrowing in portable single pens placed in a sheltered yard, even in zero weather. Tared paper was put on the studding, and the pen tightly boarded outside and inside. A ceiling of slats was put in the pen, and the space above the ceiling stuffed with straw. A window in the side, a small ventilator running from the ceiling out through the roof, and a lighted lantern hung in the pen on the coldest days when the pigs were very small, completed the equipment. The air in this pen always felt dry and comfortable, and the pigs all kept healthy and thrifty. (See under "Portable Pens," Page VI.)

It pays to treat sows kindly and to have them quiet. If they are on good terms with the attendant and regard him as a friend, there is much less danger of trouble from nervous, excited sows when the critical time of farrowing arrives.

Feeding and Management after Farrowing.—After farrowing, the sow should not be disturbed, and if she lies quietly for ten or twelve hours, or even more, so much the better. When she wants anything she will go to the trough for it. At first she should have little more than a drink. A very thin slop of middlings and water will answer very well. If the weather is cold, tepid water should be used. During the first three days, great care must be exercised not to overfeed, and the ration should be kept very light. After this, the feed may be gradually increased, taking a week or ten days to reach full feed. A good mother with a large litter requires very liberal feeding, but if the litter is small, it may be necessary to reduce the feed.



Fig. 16.—Champion Poland-China sow at the Illinois State Fair.

different rations are used for nursing sows. Equal parts of finely ground corn and wheat middlings, allowed to soak between feeds, makes a most nutritious ration. If sweet skim-milk can be added to the mixture, it makes an excellent ration. Corn may be used as recommended for sows before farrowing, in larger quantities if skim-milk is available. A certain amount of roots and green feed are always in order, but the sow should not be expected to subsist upon these alone at this time. A limited amount of bulky, succulent feed helps to keep the sow healthy.

If the sow's udder may become hard and inflamed. If so, it is a good plan to wash the udder thoroughly with hot water and apply equal parts of lard and turpentine.

When the pigs are weaned, the feed should be cut down to check the secretion of milk. Dry oats make a safe feed for the sow for a few days after the pigs are weaned. If the udder gets very full, it is a good plan to turn the sow in with the pigs for a few days.

Sows which Eat their Pigs.—Occasionally a sow will be found which will eat her pigs. It is claimed by some that the tendency to eat their young is sometimes caused by allowing sows to eat their afterbirth. As a precautionary measure, the afterbirth should be promptly removed from the pen. There is little doubt that the trouble is generally caused by a fevered condition in the sow, often induced by injudicious feeding before farrowing, or even after farrowing. A remedy that has been suggested is to feed the sow salt pork, but the danger is that once the sow has eaten her pigs she acquires the habit and is likely to do it again. Unless she is a very valuable sow, it is safer not to give her a second opportunity, but to turn her into the feed lot and fatten her for the butcher.

THE YOUNG PIGS.

Feeding and Management before Weaning.—When the pigs are born, the attendant should be on hand to see that everything goes well. If the pigs



Fig. 17.—Group of young Large Yorkshire sows. Note the uniformity of type and the excellent quality throughout.

are strong and the sow lies quiet, it is better not to interfere. Sows that have been properly fed and given sufficient exercise seldom have difficulty in farrowing.

If the pigs seem somewhat weak, or if the sow is very restless, it is safer to place the pigs in a well-bedded box or basket to keep them out of the way until all are born. If the pen is chilly, a bottle of hot water placed in the bottom of the basket and covered with a blanket, with another blanket over the top of the basket will help keep up the vitality of the pigs.

The pigs should be placed to the teat to suck as soon as possible. The weaker the pigs, or the colder the pen, the more important an early drink of the mother's milk becomes. If parturition is not unduly protracted, and if the pigs are strong, lively, and comfortable, they may wait for their first drink until all are born, but in such matters the attendant must use his judgment.

In cases of difficult parturition, a pig that is apparently lifeless can often be revived by opening its mouth and blowing into it. To be successful, this operation must be performed as soon as it is born. A chilled pig can sometimes be revived by immersing up to the neck in water heated to a temperature of about 98 degrees

When moved from the water, it should be rubbed dry, and induced to suck if possible.

As soon as the sow appears to have settled down quietly, it is best to put the little pigs with her and leave them together. It is well not to interfere except when it is absolutely necessary.

By the time the pigs are about three weeks old they will have learned to eat. If at all possible, it is a good plan to give them access to another pen in which is kept a small trough. Here they can be fed a little skim-milk with a very little middlings stirred into it. The quantity of middlings can be increased gradually as the pigs grow older. If they can be taught to nibble at sugar-beets or mangels during this time, so much the better. A small amount of soaked whole corn, or almost any other grain, scattered on the floor of the pen, will cause them to take exercise while hunting for it. If it is not possible to provide an extra pen, the sow may be shut out of the pen while the pigs are being fed. Many people simply allow the young pigs to eat with the sow, and many good pigs are raised in this way, but better results will be obtained if the pigs can be fed separately.

Exercise is very important for young pigs, and every possible means of securing it must be adopted. If they are kept in a small pen with the mother, some of the best of them will likely become too fat, and probably sicken and die. Outdoor exercise is especially beneficial, but pigs should be protected from cold winds or from a very hot sun. If the sow is turned out with her pigs, it is not well to give her a very large range at first, as she is likely to travel too far and unduly tire the pigs.

Boar Pigs not intended for breeding purposes should be castrated before weaning, to get the best results, though there is not much danger from castrating at a later date, provided care is exercised in connection with the operation. Clean hands, a clean knife, and the use of a disinfectant upon the wound will obviate practically all danger.

Ruptured Pigs.—Pigs ruptured in the scrotum may be easily castrated as follows: Have an assistant hold the pig up by the hind legs. In making the incision, cut only through the skin of the scrotum, being careful not to cut the membrane or sac which envelops the testicle. Then draw out the testicle enclosed in its membrane, and, at the same time, work the intestine back into the body of the pig. With the pig held as described, the intestine will go back to its place with little or no assistance. Having drawn out the testicle far enough, tie a strong string tightly around the cord of the testicle (including the membrane), and then cut away the testicle (enclosed in its membrane) just outside of where the string is tied. Leave the ends of the string three or four inches long, so that they hang outside the wound. If the string does not come away in a couple of weeks, it may be pulled out.

If the rupture is only on one side, the remaining testicle may be removed in any way. The scrotum should be washed with disinfectant before any operation is made. The hands of the operator and the knife should also be washed with disinfectant, and the string should be soaked in disinfectant before it is used. The incision in the scrotum should extend well downwards to facilitate drainage from the wound. These simple precautions assure success.

The writer has employed this method successfully, and when the wound heals could tell that the pig had been ruptured.

Feeding and Management after Weaning.—There is considerable difference of opinion as to the best age at which to wean pigs. Some advocate leaving the pigs with the sow for ten or twelve weeks—in fact, the sows are allowed practically to wean her own pigs. For producing show pigs this method may answer very well, but it means only one litter a year; at any rate, it does not admit of two litters a year. The average farmer will find it more profitable to wean his pigs early enough to permit two litters a year to be raised. If the young pigs have been taught to eat as described, and skim-milk is available, they may be weaned successfully when six weeks old. It is true that many pigs are weaned before they are six weeks old, but it is seldom advisable to do so if they appear to be thriving with the sow. If skim-milk is not available, it is generally advisable to defer weaning for two weeks more, and special pains should be taken to have the pigs well accustomed to their new feed, and eating heartily before they are weaned. (See Part III, "Substitutes for Skim Milk".)

Skim-milk and middlings make about the best feed for young pigs after weaning. If the middlings are fine and floury, which is not very likely to occur under present-day methods of milling, they will sometimes cause indigestion, which may show itself either in the form of diarrhoea or constipation. Diluting the middlings with a little bran or finely ground oats will help prevent the trouble. Soaking or scalding the middlings will also tend to prevent digestive troubles. Scalding the middlings is especially useful when no skim-milk is to be had, as it makes the pigs like the feed better. To scald the middlings, it is best to pour boiling water on them, cover the vessel, and allow to stand several hours, or from one time of feeding until the next. When the pigs are first weaned, it is better to feed four times a day, giving only a small quantity of feed each time, and taking care to keep the trough clean. When well started, they may be changed to three feeds a day.

It is not well to be in a hurry to commence feeding grain. Generally speaking, when pigs are about three months old a little grain may be introduced into their ration. Two parts of middlings and one part of corn meal or ground barley, mixed with skim-milk to form a slop, make an excellent ration for growing pigs. As the pigs grow older the proportion of grain to middlings may be increased, but at no time should they be fed exclusively or almost exclusively upon corn, because corn is a poor bone and muscle-former. The importance of feeding supplementary feeds with corn has been pretty fully discussed under the work of experimental stations. The need of such feeds is most important during the early life. A few roots will be found most helpful in keeping young pigs healthy during the winter, and green feed of almost any kind will answer the purpose during the summer. The feeder has a wide range of feeds to choose from, and if he understands something of their nature he should have no difficulty in compounding a ration which will give satisfaction.

The aim should be to develop bone and muscle during the early stages of growth, and, while the pigs should be thrifty and sleek in the hair, they should not be fed in such a way as to overload them with fat. This is especially true of pigs which are intended for breeding purposes, and which should be carried right through to breeding age upon feeds which stimulate growth and general vigor rather than fat. A reasonable amount of fat is not objectionable, but the development of the frame, the muscular system, and the vital organs must not be neglected if a satisfactory breeding animal is to be produced. Variety in feeds and plenty of exercise are very essential features in raising an animal that will possess a round development.

Cost of Raising Pigs.—The Ontario Agricultural College obtained some figures relative to the cost of raising young pigs until six weeks old, at which time they are commonly weaned.

For example, the following were valued as follows: Meal of all kinds, including bran and middlings, \$20.00 per ton; roots, \$2.00 per ton; skim-milk, 15 cents per 100 pounds.

It was assumed that the sow raises two litters a year, and that she nurses each litter six weeks. This would leave about nine and one-quarter months during the year when the sow would not be nursing pigs, and the cost of maintaining the sow during this time she is dry is estimated at 75 cents a month, it being assumed that the sow is fed as economically as possible during that time. The maintenance of the sow during nine and one-quarter months at 75 cents per month amounts to \$6.94, and the cost of feed consumed by the sow and pigs before the pigs are weaned amounts to \$7.00. Half of this amount, \$3.50, is charged against each litter in addition to the cost of feed consumed by the sow and pigs before the pigs are weaned.

Interest on investment, labor, and manure are left out of the calculation. The number of litters of pigs were used, which were weaned at six weeks old in each year.

The following table gives particulars of each litter:

Sow's Litter	No. of Pigs in Litter	How Bred.	Cost of Feeding Sow and Litter for Six Weeks.
1	4	Pure Yorkshire	\$3 20
2	9	Berkshire sire, Tamworth dam	3 00
3	6	Pure Yorkshire	3 87
4	5	Yorkshire sire, Tamworth dam	3 70
5	8	Yorkshire sire, Tamworth dam	3 04
6	3	Yorkshire sire, Berkshire dam	5 85
7	9	Berkshire sire, Yorkshire dam	4 31
8	8	Pure Yorkshire	4 33
9	8	Pure Tamworth	3 88
10	8	Yorkshire sire, Tamworth dam	3 94
11	6	Tamworth sire, Berkshire dam	3 33
12	4	Tamworth sire, Berkshire dam	2 37
	<hr/> 64		<hr/> 3 74

Total and Average Costs.—To arrive at the total cost of the pigs at six weeks old, the service fee and half the cost of maintaining the sow when dry are added to the average cost of maintaining the sow and litter for six weeks, the total cost as follows:

Service fee	\$1 00
Half cost of maintaining dry sow ($\frac{1}{2}$ of \$7.00)	3 50
Average cost of feed for sow and litter	3 74
<hr/> Total	<hr/> \$8 24

Average number of pigs in litter, $6\frac{1}{2}$.
Average cost per pig six weeks old, \$1.27.

Variations in Cost.—If the cost of maintaining the dry sow were placed at \$1.00 a month, it would bring the cost of the young pigs to \$1.44 each at six weeks old. It is probably a safe statement, therefore, that young pigs can be

raised to the age of six weeks at \$1.50 each, making some allowance for items not considered in the experiment described.

J. H. Grisdale, Central Experimental Farm, Canada, estimates that a breeding sow can be maintained during a whole year at from \$12.00 to \$15.00, under careful management, and produce two litters during the year. This approximates very closely, the Ontario results, which, omitting service fee, make the cost of maintaining a sow half a year, and one litter of pigs for six weeks, \$7.24.

Since the above calculations were made, there has been a very material increase in the cost of feeds, but if we add 50 per cent. to the cost of maintenance all round, the cost of a pig six weeks old is about \$1.85, which is a very moderate cost.

FATTENING.

Many of the problems connected with the fattening of hogs have already been discussed under experiment station work. Corn may be used much more freely for fattening hogs than for those intended for breeding, but experiments show conclusively that corn has its limitations, even for fattening, and that it is greatly improved by having some feed richer in protein combined with it. The importance of using some sort of supplementary feed with almost any meal ration in order to give bulk and variety has also been demonstrated, and the important place which pasture may play in the fattening of hogs has been quite fully dealt with. There are a few general facts of more or less importance remaining to be given under this heading.

Winter Feeding.—Generally speaking, winter feeding is more expensive than summer feeding. Part of the extra feed required in winter is probably due to the fact that more feed is required to keep up the heat of the body during cold weather. There is little doubt, however, that much of the advantage of summer feeding is due to more sanitary surroundings—that is, more fresh air and outdoor exercise, coupled with more succulent feed, which seems to aid digestion. The man who feeds hogs in winter, therefore, should aim to approach summer conditions as nearly as possible. He cannot get summer temperature, it is true, but he can provide a fair amount of fresh air, and feeds that will keep the digestive organs in good condition. It is just here that a man who grows a few roots for winter feeding has a great advantage over the man who does not. Skim-milk, buttermilk, and alfalfa may also be made to perform a useful part in giving variety and aiding the digestive organs to perform their functions properly.

Quantity of Feed—The test of the skill of the feeder is his ability to keep just slightly within the appetite of the animals under his charge. He must watch the animals closely and see that they clean up with apparent relish and that he gives them. Feed left in the trough is a sign that something is wrong with the methods employed, and to have to cut back in the quantity of feed means a loss of time. The quantity should be so gauged that there is a gradual increase as fattening advances, and radical changes, either in quantity or kind, should be avoided. To be successful, the feeder must learn the lesson that all changes should be made gradually, and that undue haste in fattening may mean serious delay in the process, together with a waste of feed.

Regularity and Comfort.—Regularity in time of feeding is necessary to regularity in the appetite of the animal. The animal which is fed at the same hours every day will take more feed with less danger of surfeiting than the one fed at any time to suit the convenience of the feeder.

By comfortable quarters, and sanitary conditions generally in pen or feed lot, are important factors in securing satisfactory gains, and in avoiding disastrous loss through disease.

Cost Increases with Age.—Prof. Henry, in "Feeds and Feeding," gives a very instructive table, compiled from results from numerous experiment stations, showing the feed consumed per 100 pounds gain by hogs of different weights. Following is an abbreviation of the table as given in Prof. Henry's book:

Weight of Animals Pounds.	Total Number of Animals Fed	Average Feed Eaten Per Day.	Feed Eaten Daily per 100 lbs. Live Weight.	Average Gain Per Day.	Feed for 100 lbs. Gain.
150-200	174	lbs. 2.23	lbs. 5.95	lbs. .76	lbs. 293
200-250	417	3.35	4.32	.83	400
250-300	495	4.79	3.75	1.10	437
300-350	489	5.91	3.43	1.24	482
350-400	300	6.57	2.91	1.33	498
400-450	223	7.40	2.74	1.46	511
450-500	105	7.50	2.35	1.40	535

The table shows that the heavier hogs made more rapid gains and consumed less feed per 100 pounds of their live weight, but there was a steady increase in the amount of feed required for 100 pounds gain as fattening advanced.

A similar result was obtained at the Ontario Agricultural College with 36 pigs of different breeds, as shown by the following table:

Live Weight of Hogs.	Meal Required for 100 pounds Increase in Weight.
140 lbs.	310 pounds.
150 lbs.	375 pounds.
160 lbs.	438 pounds.
180 lbs.	455 pounds.

These figures, together with others that might be given, show very clearly that the rate of production steadily increases as the hogs become older.

Correctives.—Swine appear to have a craving for what might be called "stomach" substances. This is especially true of hogs which are kept in confinement, which will eat greedily such substances as charcoal, ashes, mortar, soft rotten wood. It is probable that some of these substances are not good for the animal, but there is no doubt that charcoal and wood ashes have a beneficial effect. Charcoal made from corn cobs answers very well. It is a good practice to supply the hogs with charcoal, especially during the winter months, but, if the hogs had any charcoal for a considerable time and are then given a liberal ration, there is danger that they may take too much for their own good. The quantity must be observed in regard to salt.

Dr. Louis, a veteran American swine breeder, recommends the following: 3 bushels of charcoal, 8 lbs. salt, 2 quarts of air-slaked lime, and 1 bushel of wood ashes. Break the charcoal well down, and thoroughly mix with the other ingredients. Then take 1¼ lbs. copperas, dissolve in hot water, and with a

watering pot sprinkle over the whole mass, and mix thoroughly again. Put this mixture in boxes and place where hogs of all ages can eat it at pleasure."

This mixture is spoken of very highly by many who have used it.

Another very good mixture can be made up of one part salt, one part sulphur and about ten parts of wood ashes. This is placed in boxes where pigs have free access to it.

Prof. Dietrich recommends keeping salt, charcoal, air-slaked lime, bone meal and wood ashes in separate compartments of a trough, so that the pigs can take what they desire of any one of the substances. Sods make a good corrective for swine. A wagon-load or two of sods placed conveniently near the piggery so that the feeder can throw one or two into each pen occasionally will be found very beneficial during the winter.

Hogs that are out-doors during the summer and have access to earth and vegetable matter have little need of other correctives.

Money Returns for Feed Consumed by Hogs.—Some interesting results have been obtained by the Ontario Agricultural College relating to the value it is possible to obtain for feed consumed by hogs, when the hogs are sold at varying prices per pound live weight. The investigation includes hogs fed by the College, as well as a large number fed by farmers throughout the Province. The following summary shows the scope of the investigation:

Number of hogs	297
Weight when marketed	56,718 pounds.
Average weight per hog	190.9 "
Total meal consumed, which included barley, peas, oats, corn, middlings, and bran.....	165,911 "
Total skim-milk consumed	112,500 "
Total roots consumed	64,600 "
Miscellaneous feeds, such as pasture, green feeds, etc., valued by experimenters at...	\$77 00

The pigs are valued at \$1.50 each at weaning time. This amount, together with the value of the skim-milk at 20 cents per cwt., roots at 10 cents per bushel and the miscellaneous feeds valued at \$77.00, is first deducted from the gross proceeds derived from the assumed sale of the hogs at each of the different prices per pound, and the remainder represents the cash received for the meal consumed by the hogs. The following table shows the prices obtained for feed, under each valuation of the hogs when sold:

Prices Realized for Feeds Consumed by 297 Hogs.

Assumed Selling Prices of Hogs, Live Weight.	Meal, including Mixed Grain, Middlings and Bran.	Milk.	Roots.
	Per ton.	Per cwt.	Per Bush.
If sold at 4½ cents per pound	\$20 45	\$0.20	\$0.10
If sold at 5 cents per pound	23 87	.20	.10
If sold at 5½ cents per pound	27 29	.20	.10
If sold at 6 cents per pound	30 71	.20	.10
If sold at 6½ cents per pound	34 13	.20	.10

Figures such as the above, obtained from a large number of hogs fed under various conditions, carry considerable weight. They show that the hog is able to give a good account of the feed he consumes, provided he is handled with intelligence. Of course, the figures in the table are averages. Some tests showed larger returns and some did not show as large, but it is worthy of note that two tests which showed exceptionally good results were omitted from the computation in order to make the results as conservative as possible.

PART V.

CURING PORK

Farmers' Bulletin 183 of the U. S. Department of Agriculture, by Professor Andrew Boss, gives much useful information regarding the curing of meats, and has been liberally drawn upon in the preparation of material for this section.

Cooling.—"Meat must be properly and thoroughly cooled to insure good keeping qualities when cured. If salted before the animal heat is out, the shrinkage of the muscles causes the retention of injurious gases, giving an offensive odor to the meat. Neither should meat be frozen when salted, as the action of the frost will prevent the proper penetration of the salt, and uneven curing will result. While the temperature cannot well be controlled on the farm, it is possible to slaughter when the weather is favorable to cooling the carcass before the surface freezes. The most desirable temperature for cooling meat is 34 to 40 degrees Fahrenheit. It is important, also, that meat be cured as soon as cooled, and while still fresh. Ordinarily, twenty-four to thirty-six hours after slaughtering will allow sufficient time for cooling."

Vessels for Curing.—"A clean, hard-wood barrel is a suitable vessel in which to cure meat. A barrel made for the purpose is best, but where it cannot be had, a cask or syrup barrel will answer. The important point is to have it clean and tight enough to prevent leakage. A large stone jar is the best vessel that can be had. A barrel or a jar that has once held meat may be used again and again, unless meat has been spoiled in it. If used repeatedly, it will be necessary to wash it out thoroughly each time before packing with fresh meat."

Brine Curing and Dry Curing.—"Brine-cured meats are best for farmers for the reason that a suitable place for dry curing is not usually obtainable. It is also less trouble to pack the meat in a barrel and pour on a brine than to rub in the salt three or four times. The brining method also gives protection from insects and vermin. Trouble is sometimes experienced in brine, but if pure water is used and directions followed in making the brine (see next paragraph), there should be no difficulty in keeping it for a reasonable length of time. During warm weather, brine should be closely watched. If it becomes 'ropy,' like syrup, it should be boiled, or a new brine made. A cool, dry place is the best place for brine curing. Dry curing may be done successfully in a cellar also, though even more moisture is needed to effect a thorough cure. The cellar should be dark and tight enough to prevent flies and vermin from reaching the meat."

Plain Salt Pork.—"Rub each piece of meat with fine, common salt and pack closely in a barrel. Let stand over night. The next day weigh out ten pounds of salt and two ounces of saltpetre to each 100 pounds of meat and dissolve in four gallons of boiling water. When cold pour this brine over the meat, cover, and weight down to keep it under the brine. Meat will pack best if cut into pieces about six inches square. The pork should be kept in the brine until used."

To keep the meat under the brine use a loose-fitting wooden cover, and weight with a heavy stone or several vitrified bricks. The cover should be made of some hard wood, oak preferred. Such woods as pine or cedar will taint the brine.

Sugar-cured Hams and Bacon.—"When the meat is cooled, rub each piece with salt and allow it to drain over night. Then pack it in a barrel with the hams and shoulders in the bottom, using the strips of bacon to fill in between or to put on the top. Weigh out for each 100 pounds of meat 8 pounds of salt, 2 pounds of brown sugar and 2 ounces of saltpetre. Dissolve all in four gallons of water, and cover the meat with the brine. For summer use it will be safer to boil the brine before using. In that case it should be thoroughly cooled before it is used. For winter curing it is not necessary to boil the brine. Bacon strips should remain in this brine four to six weeks; hams, six to eight weeks. This is a standard recipe, and has given the best of satisfaction. Hams and bacon cured in the spring will keep right through the summer after they are smoked."

The length of time the meat is kept in the brine depends upon the size of the pieces. A large ham takes more time to cure than a small one.

Dry-cured Pork.—"For each 100 pounds of meat weigh out 5 pounds of salt, 2 pounds of granulated sugar, and 2 ounces of saltpetre, and mix them thoroughly. Rub the meat once every three days with a third of the mixture. While the meat is curing it is best to have it packed in a barrel or a tight box. For the sake of convenience, it is advisable to have two barrels, and to transfer the meat from one to the other each time it is rubbed. After the last rubbing the meat should lie in the barrel for a week or ten days, when it will be cured and ready to smoke. To cure nicely it is desirable to have a cool and rather moist place in which to keep it. This recipe should not be used where the meat must be kept in a warm and dry place, as the preservatives will not penetrate evenly and uniformly."

Smoking.—"The smoke-house should be eight or ten feet high to give the best results, and of a size suited to the amount of meat likely to be smoked. One 6 by 8 feet will be large enough for ordinary farm use. Ample ventilation should be provided to carry off the warm air in order to prevent overheating the meat. Small openings under the eaves or a chimney in the roof will be sufficient if arranged so as to be easily controlled. A fire-pot outside of the house with a flue through which the smoke may be conducted to the meat chamber gives the best conditions for smoking. When this cannot well be arranged, a fire may be built on the floor of the house and the meat shielded by a sheet of metal. Where the meat can be hung six or seven feet above the fire, this precaution need not be taken. The construction should be such as to allow the smoke to pass up freely over the meat and out of the house, though rapid circulation is at the expense of the fuel."

"Brick or stone houses are best, though the first cost is greater than if they are built of lumber. Large dry goods boxes, and even barrels, may be made to serve as smoke-houses where only small amounts of meat are to be smoked, but a permanent place is much more satisfactory."

The best fuel for smoking meats is green hickory or maple wood smothered with a dust of the same material. Hard wood of any kind is preferable to soft wood. Corn-cobs are the best substitute for hardwood, and may be used if

meat that is to be smoked should be removed from the brine two or three days before being put in the smoke-house. Washing the meat in tepid water and scrubbing clean with a brush is a good practice. The pieces should then be hung up for a day or two. When drained they may be hung in the smoke-house. All should be suspended below the ventilators, and should hang so that no pieces come in contact.

A slow fire may then be started, warming up the meat gradually. During the winter months in cold climates it is best to keep the fire going continually until smoking is complete, holding the temperature at about the same point. In the spring months and in the summer, a light fire may be started every second or third day for a couple of weeks, the meat being allowed to hang in the smoke-house until sufficiently colored. When the fire is kept going steadily, twenty-four or thirty-six hours will be required to finish one lot of meat. Smoke will not penetrate frozen meat. As soon as smoked sufficiently the meat should be cooled by closing the ventilators or doors. When hard and firm it may be packed away.

Keeping Smoked Meats.—"A dry, cool cellar, or an attic with free circulation, will be a satisfactory place for smoked meats at all seasons, if it is kept dark and flies are excluded."

If to be held only a short time, hams and bacon will need only to be hung out separately without covering. For longer keeping it will be necessary to wrap them first in paper, and then in burlaps, canvas, or muslin, and bury them in a grain (or in wood ashes) or other suitable place, the object being to gain a uniform temperature and to keep away insects. For absolute safekeeping for an indefinite period of time, it is essential that the meat be thoroughly cured. After it is cured and has become dry on the surface, it should be wrapped in parchment paper or old newspapers. Then inclose in heavy muslin or canvas, and cover with a slow wash or ordinary lime whitewash, glue being added to the whitewash. Hang each piece out so that it does not come in contact with other pieces. Do not stack in piles."

Trying Out Lard.—"Only the best of fat should be used for choice lard. Leaf lard is the best. The back strip of the side also makes nice lard, as do the ham, shoulder, and neck trimmings. Gut fat should never be mixed with the leaf and back fat. It makes a strong-smelling lard and should be kept separate. All scraps of clean meat should be cut out of the fat before trying out, as they are very apt to stick to the kettle and get scorched, giving an unpleasant flavor to the lard. When preparing the fat for trying, cut it into pieces from 1 to 1½ inches square. They should be nearly equal in size, so that they will try out in about the same time. Fill a clean kettle about three-fourths full, and put in a quart of water, or, if convenient, a quart of hot lard. One or the other is necessary to prevent the fat from burning before the heat is sufficient to bring out the grease. Keep the kettle over a moderate fire until the cracklings are brown and light enough to float. Frequent stirring is necessary to prevent burning. When done, remove from the stove and allow to cool slightly, and then strain through a muslin cloth into a suitable jar or crock. Stirring while the lard is cooling whiten it and make it smoother. A quarter of a pound of saleratus (baking soda) added to each 100 pounds of fat has a like effect."

PART VI.

BUILDINGS

The question of buildings for swine is such a complicated one that it seems almost a hopeless task to attempt a discussion of the subject. Almost every piggery that is built possesses certain features peculiar to itself and rendered necessary by the circumstances which it is intended to meet. All that can be attempted is to discuss the most desirable features of a piggery, for the general guidance of those who wish to build, but every man will have to adapt his building to his own peculiar requirements.

The most important qualities of a piggery are dryness, ventilation, light, freedom from draughts, reasonable warmth, and convenience.

Dryness.—Dryness is closely associated with ventilation, but is also influenced by the material of which the building is constructed. Good results cannot be obtained in a damp pen, and dripping walls are a pretty sure indication of impending disaster. Stone and cement walls are very cold in winter and chill the air of the pen, causing it to deposit its moisture upon their surface. In a short time the wall becomes quite wet, and trouble is stored up for the pigs. A hollow cement or hollow tile wall is much less objectionable than a solid one, but there is little doubt that wooden walls, constructed in such a way as to form a complete dead-air space inside are the best.

The floors and foundation may be constructed of cement concrete, and the foundation may rise about two feet above the surface of the floor. This will preserve the wood of which the walls are constructed and it is not likely to prove at all injurious to the pigs.

A very good wall can be made by setting two-by-four scantlings on end, and first boarding inside and out with rough lumber. This rough lumber should then be covered with tarred paper, and then the walls should be tightly boarded up with matched lumber. If preferred, the outside of the pen may be clapboarded. Smooth, matched lumber is best for the inside of the pen. Patent building paper may be used outside.

If it is thought desirable to have a loft over the pen, the ceiling can be made of poles, placed a few inches apart, and well covered with straw. The straw absorbs moisture and helps to keep the pen dry. Where this is done, the straw should be renewed at least every year, otherwise it becomes a harbor for dust and disease germs.

Ventilation.—Thorough ventilation is a great help in preserving dryness, but it is a difficult thing to secure in a piggery without unduly lowering the temperature. It is an aid to ventilation to provide a large air space; in other words, to have a high ceiling. Some breeders have no loft over the piggery, but have the space above the pigs extend to the roof. This gives more air space and makes ventilation a simpler problem, but it necessitates lining the under side of the rafters with matched lumber in order to prevent the pen from becoming too cold.

There are two well-known methods of ventilation. One of these is the King system. In this system, fresh air is admitted by constructing shafts in the walls at intervals of about fifteen feet. The shafts may be about four by six inches, inside measurement, and open outside near the ground, and inside at the ceiling. Provision should be made for closing, or partially closing, these intakes when cold air is admitted too rapidly. The shafts for carrying out the foul air should

eight inches square, starting near the floor and running out through the ceiling. It is usually more convenient to place these outlet shafts beside the wall, in which case, after passing through the ceiling, they may follow the slope of the roof to the peak, where they can be given outlet. In any case, the top of the shaft should be higher than the peak of the roof. The inside of the

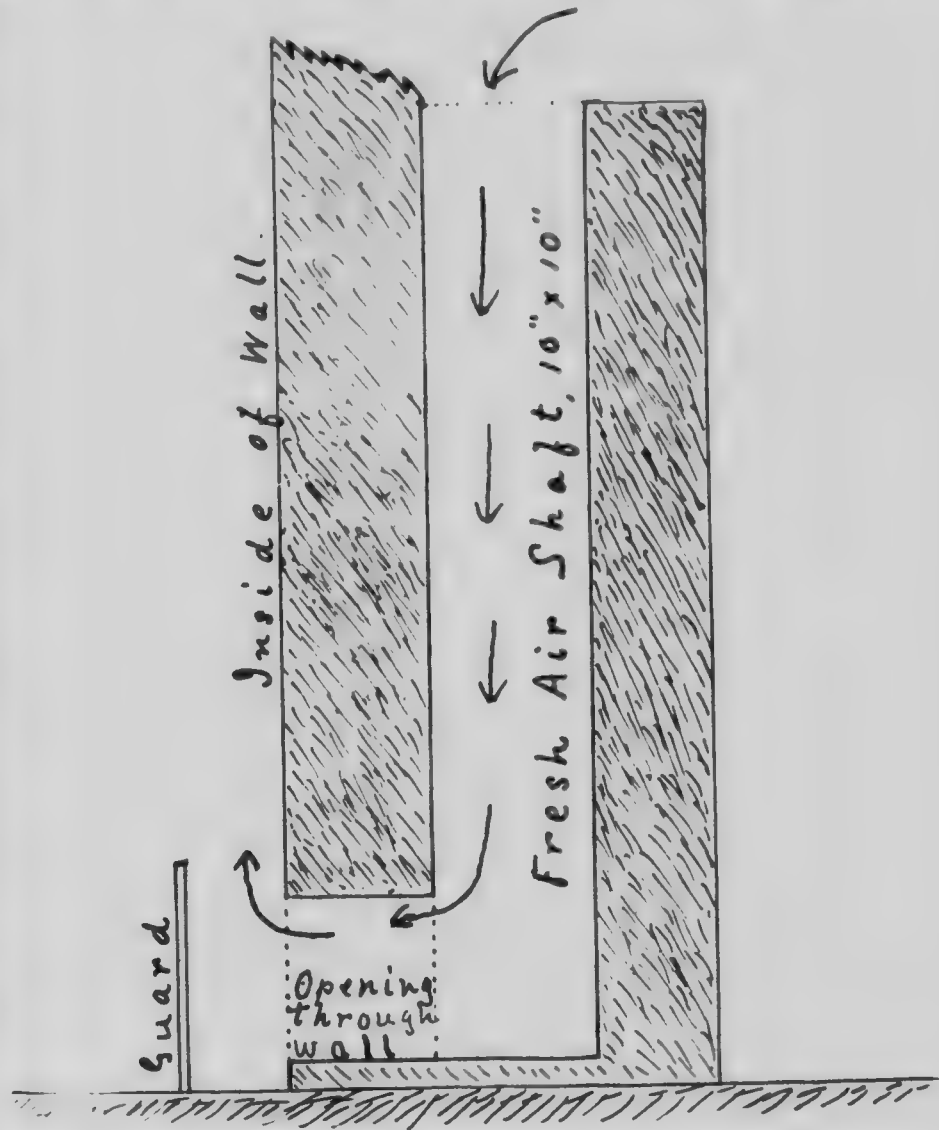


Fig. 18.—Method of admitting fresh air.

shaft should be perfectly smooth, and there should be no sudden turns in its path. A right-angled turn will render an outlet shaft practically useless. The second method takes in the fresh air at, or near, the floor, and the foul air is removed through shafts which open at the ceiling, and run straight up through the roof. As in the other case, the top of the shaft should be higher than the peak of the roof. Fig. 18 shows how the inlet is constructed. The drawing shows the structure made of concrete, but it may be made of wood if desired.

Both inlets and outlets should be fitted with slides on the inside of the pen, so that the inflow and outflow of air may be regulated to suit circumstances. There should also be a guard placed in front of the opening, several inches from the wall, to turn the current of cold air upwards, and thus prevent a direct draught into the pen.

If a feed cooker is used, it could be utilized to great advantage in assisting ventilation. If the building is not a very long one, the chimney may be constructed at the opposite end of the building from the feed cooker, and the pipe from the feed cooker run the whole length of the building before it enters the chimney. In a long building the chimney may be placed about the centre, so as not to have too great length of stove-pipe. The heat from the stove-pipe has a wonderful influence in aiding the circulation of air in the pen, as well as modifying the temperature and helping to keep the air dry.

In fact, where winter litters are raised in large pens, some helpful device like this is absolutely necessary.

Light.—Light, especially sunlight, has a wonderful influence in promoting health. So far as possible, the windows should be on the south side of the building, because the south side gets the most sun and is least exposed to cold winds.

Draughts.—While ventilation is necessary, draughts are extremely injurious, and their prevention should be kept in view when building.

Warmth.—Warmth is a good thing, but it should not be secured at the expense of ventilation. A somewhat cold pen, well ventilated, but free from draughts, is preferable to a warm pen where the air is damp and foul, and the pigs will suffer less discomfort in the former than in the latter. Very young pigs require warmer quarters than older ones, and when a sow farrows in winter special pains should be taken to secure warmth and freedom from draughts. If she is in a large piggery it is often a help to lay poles across the tops of the partitions over the bed and then cover these poles with straw.

PLAN OF PIGGERY.

A feature of this piggery is the placing of the pens and out-door yards on the south side of the building. The main windows are placed on the south side also, thus letting the sunlight freely into the pens. The main objection to the plan is the fact that it is not economical of space, because the same passage could be made to serve another row of pens on the opposite side. By making the building about twelve feet wider, a row of pens could be put on each side of the passage, in which case it would be necessary to provide for a feed-room, because it would not be practicable to have the feed-bins in the passage. The feed passage could be made narrower if the feed-bins were removed.

Troughs.—Better made of cement. Eight inches high next to the passage, four inches high next to the feeding pen, and ten inches wide, inside measurement, are suitable dimensions.

The dotted line running along the back of the feeding floor indicates the drain, which may be given a fall towards either end of the pen, to suit circumstances.

The beds should be raised several inches above the feeding floor, and given a slight fall towards the drain. The feeding floor should be given a fall from the trough to the drain.

Floors are cement. Cement makes a durable, clean, sanitary floor. A cement floor may be made as dry and practically as warm as a wooden floor by putting

Explanation

- "w" Windows, which should be large, especially on the south side.
- "d" Doors leading from pens to outdoor yards.
- "p" Doors which constitute part of partitions when closed, but which can be opened, confining the pigs to the apartment containing the bed, and leaving a passage for cleaning out the pens, taking pigs to the loading chute, etc.
- "v" Doors leading from pen to passage. Note how the partitions are set back to economize trough room. These doors should be at least eighteen inches wide.

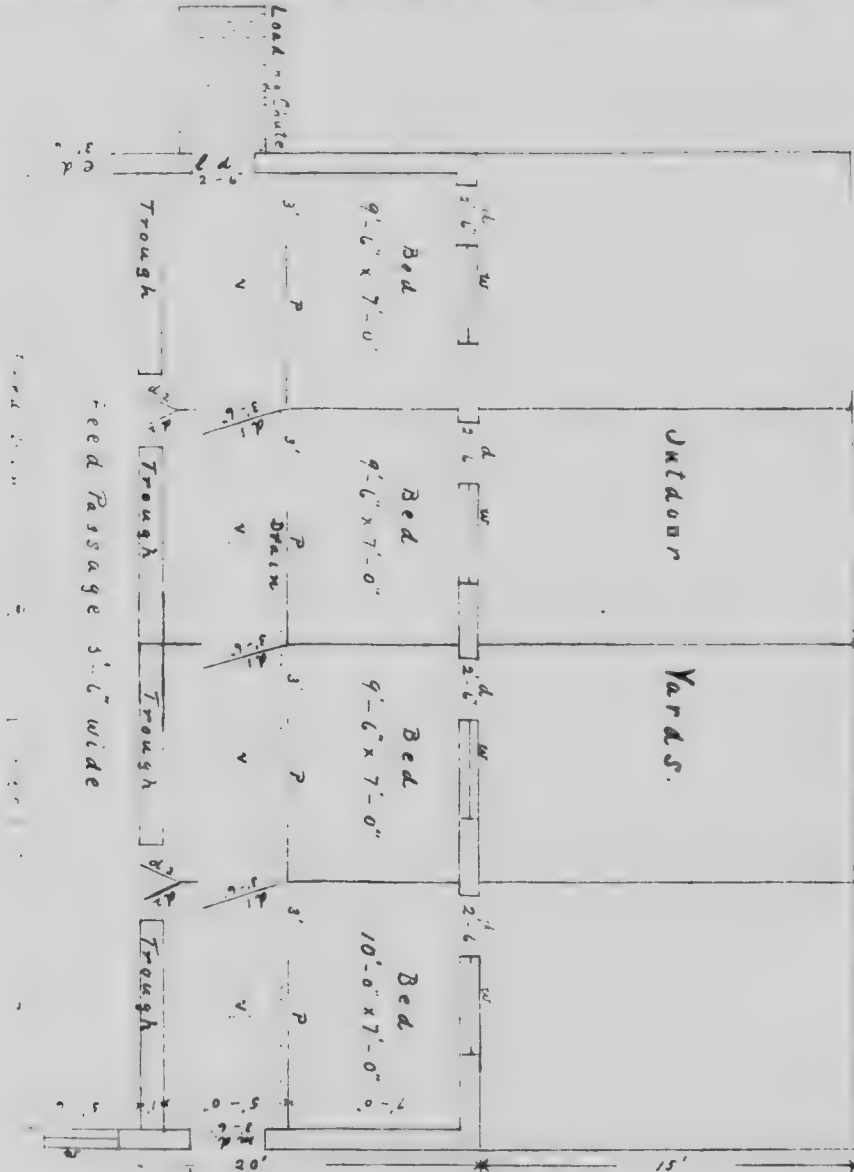


Fig. 19.—Plan of piggery.

- "m" —Door through which manure is carried when cleaning the pen.
- "l.d." Door leading to loading chute.
- "p" Partitions, three feet six inches high. These keep the bedding in place and help prevent draughts.
- "v" Ventilating shafts opening at the ceiling and running up through the roof.
- "i." —Air inlets. (See under ventilation.) If pens were made on each side of the passage, inlets would have to be made at the ends of the passage.

a coat of pitch on top of the grouting before the facing, or finishing layer, of sand and cement is put down. For this purpose, a mixture of about eight parts of pitch to one part of coal tar, applied hot, is very effective. Coal tar alone may be used, and is cheaper than the mixture just mentioned, as well as more easily applied. It is not so effective as pitch, but makes a very marked improvement in the warmth and dryness of the floor. If a person does not feel inclined to go to the expense of treating the whole floor with pitch or coal tar, he will find it well worth the extra cost to treat at least the portion occupied by the beds. If the pens are used for farrowing, it is usually safer to put a plank over-lay on

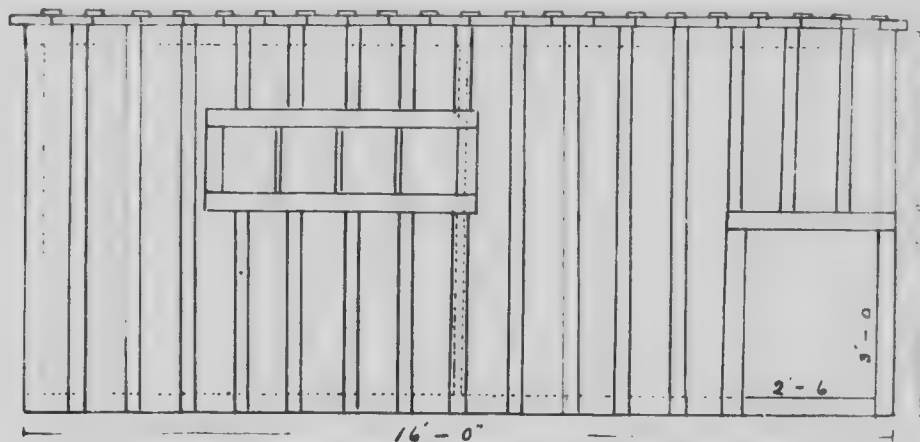


Fig. 20.—Front view of portable pen for wintering sows.



Fig. 21.—End view of pen shown in Fig. 20.

the floor of the part occupied by the bed. This over-lay, or platform, is better to be made so that it can be lifted up when it is necessary to clean and disinfect the pens.

The surface of the floors should be finished by using only a wooden float. If trowelled down smooth, they are too slippery, and are dangerous to the pigs.

PORTABLE PENS.

The accompanying sketches (Figs. 20 and 21) show a very cheap and easily constructed pen, suitable for winter quarters for breeding sows. The pen is sixteen feet long by eight feet wide. It is seven feet high in front and three and a half

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at the rear. It is boarded with cheap lumber, but all cracks are
attened. It should be practically wind and rain proof. The opening
corner, and the pen should be set with the opening towards the south.
not necessary. Plenty of bedding should be supplied and the pen should
up outside with fresh horse manure to a depth of about two feet, in
order to prevent draughts about the floor. This method of housing sows is better
than confinement in warm pens, and will be found to answer very well when
other means to provide shelter and exercise are not available.

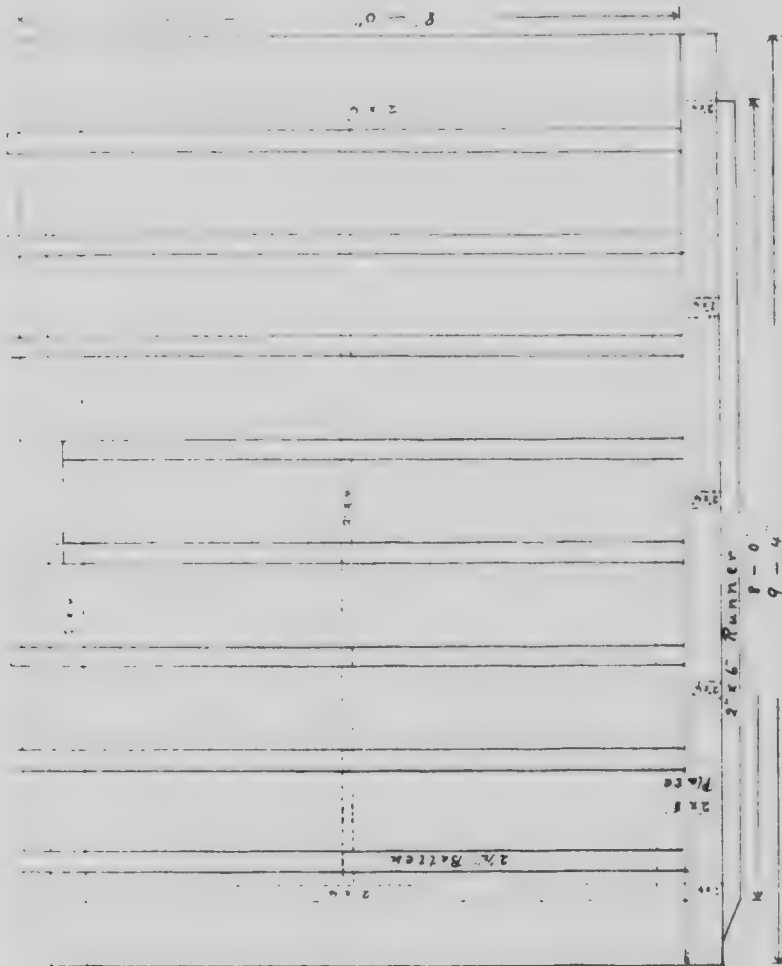


Fig. 22.—Side view of A-shaped pen.

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The A-shaped Pen.—The accompanying sketches (Figs 22 and 23) show a portable pen, which may be used for a sow and her litter, or as a shelter for two or three sows. The description is taken from Bulletin 153 of the Experiment Station. The pen is constructed by nailing inch joists, each 2 by 4 inches, and 7 feet 8 inches long, for the floor. Beneath the joists are nailed three stringers, each 2 by 6 inches, and 8 feet long, as runners for moving the house. Next, a plate piece 2 by 8 inches, and 9 feet long, is spiked to the ends of the joists, having the bottom edge by 8 inch even with the bottom of the joists, which will allow it to project 7 inches above the floor. It will also extend out 7 inches at each end.

This 2 inch by 8 inch forms a plate to which the rafters and roof boards are nailed. The 7-inch extensions of the plate at the ends support the cornice, and protect the lower corners of the roof, which otherwise would be easily split off. The 2-inch by 8-inch planks, besides strengthening the house, raise the rafters and the roof boards nailed to them at least three inches off the floor, and thereby increase the floor space and capacity of the house.

If the house is to be used in cold weather, a door will be necessary, which may be hung on hinges or made to slide up out of the way. The doorway is shown in the drawing, 20 inches by 30 inches. In the case of very large sows, it would be better to make the door three feet high.

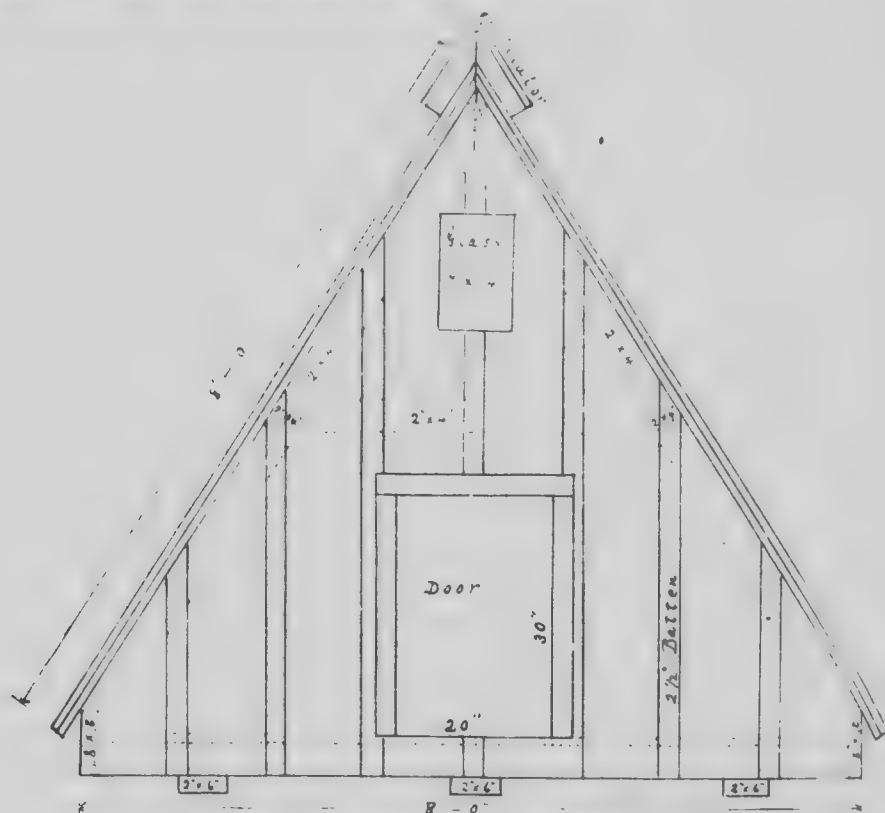


Fig. 23.—End view of A-shaped pen.

The dotted lines in the drawings indicate the scantlings which constitute the framework of the pen.

The ventilator is made by cutting the upper ends from two roof boards, opposite one another. Then 2-inch by 2-inch pieces are nailed on top of the battens on each side of the opening, meeting at the top, and boards are nailed on top of these strips on each side of the roof. The upper ends of these boards meet at the top, and the lower ends come an inch or two past the lower sides of the opening.

It is recommended to have a door at the back of the building similar to the one in front, for purposes of ventilation in hot weather; also a small opening near the peak at the rear of the building, which could be covered with a slide, and used to assist ventilation under some circumstances.

Owing to the fact that the runners are likely to decay, some prefer to have them not fastened to the building, so that they can be renewed conveniently. In

the plan shown, the runners are fastened to the structure, but they could be attached by means of bolts, so that it would not be difficult to renew them. An application of tar would save them many years.

Portable Cold Weather Farrowing Pen.—The farrowing pen shown in the illustrations (Figs. 24 and 25) is the one referred to when discussing the management of the sow. The pen is 8 feet square and five feet from the ground to the top of the roof. The base, the corner posts, and the two plates are made of 4-inch by 4-inch scantling, and the remainder of the frame is made of 2-inch by 4-inch

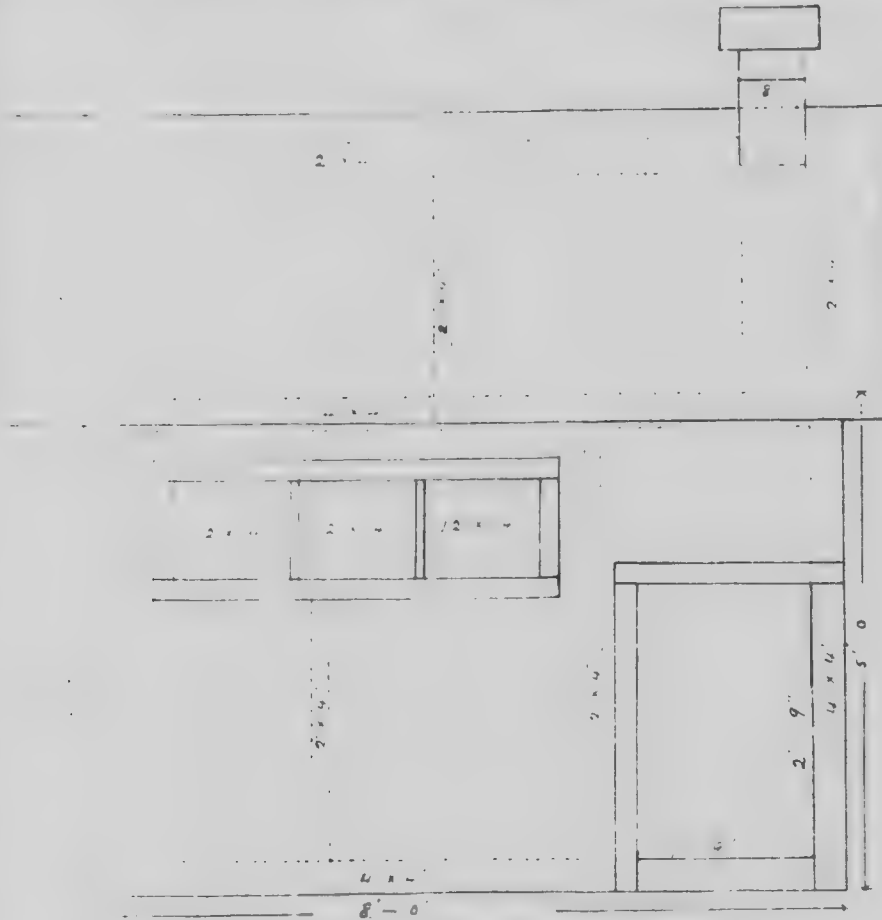


Fig. 24.—Side view of portable farrowing pen.

The dotted lines in the drawings show the position of the scantlings in the frame. A ventilator should be made in the gable at the end farthest from the ventilator. If a few strips are laid across the plates, straw can be shoved in through the opening, filling the peak of the roof, and making the building warmer. As shown by the dotted lines, the ventilator shaft is run down to the ceiling. The roof may be shingled, or made of boards with battens over the cracks. The battens are not shown in the drawing except in the end view of the roof. Outside the pen is single boarded, with battens over the cracks. Inside, tarred paper may be put on the studding and then tightly boarded, but a better job will

be made by first covering the studding with rough lumber, covering this with tarpaper, and then tightly boarding on the inside.

The window comprises three 12-inch by 14-inch panes set in a sash, which should be hinged at the top so that it will swing inwards. In hot weather it can be swung up to the ceiling and fastened there, allowing a good circulation of air.

The pen may be built on runners, or temporary skids may be provided when it is necessary to move the pen. In very cold weather, a lighted lantern hung in the pen will make it quite comfortable for new-born pigs. By the time the pigs

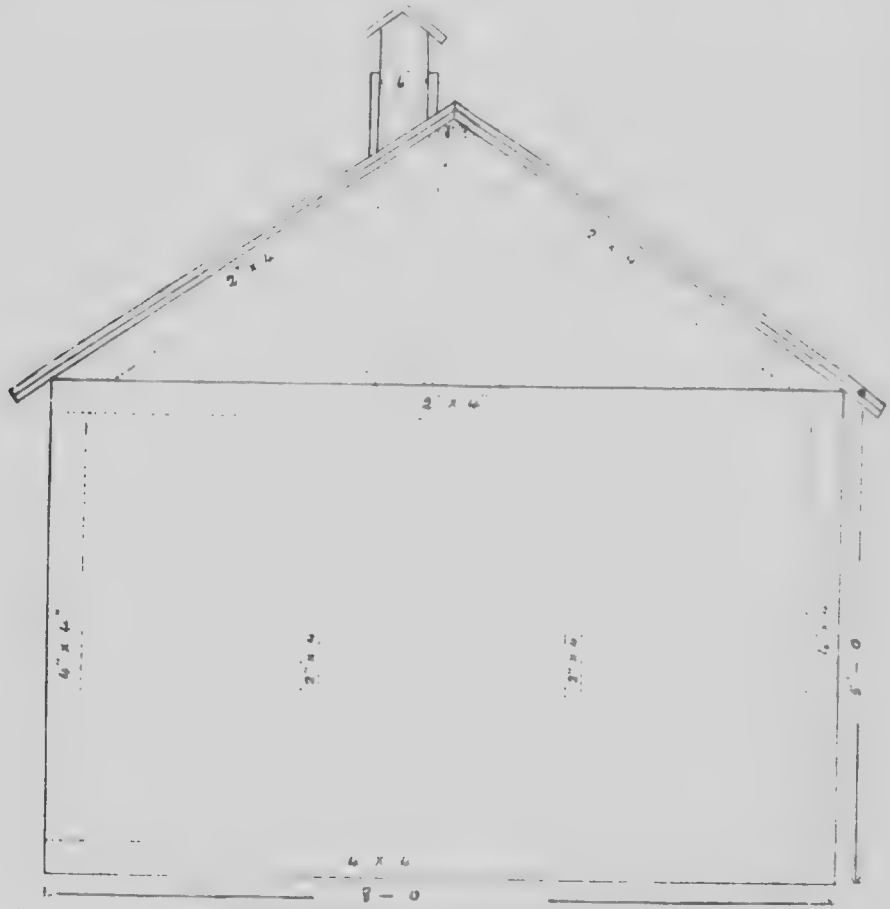


Fig. 25.—End view of portable farrowing pen.

are twenty-four hours old, the pen will need no artificial heat. A pen such as this will be found much safer for winter litters than a large building where other pigs are kept.

The various plans which have been submitted are capable of many modifications, and the man gifted with a little ingenuity may be able to improve upon them so far as his conditions are concerned. They are presented in the hope that they may prove suggestive of ideas to the man who intends to build, and each man must decide for himself what modifications would render them most suitable to his circumstances.

PART VII.

SANITATION

Swine is a difficult animal to treat when attacked by disease, and hence the owner must adopt every means within his power to prevent disease from entering the pen. One can never be too careful in this matter, and the proverb: "An ounce of prevention is worth a pound of cure," is especially applicable in the management of swine.

Cleanliness.—Filth is an excellent harbor and breeding ground for disease germs. Care should be taken to have the pens cleaned frequently, and the pens so constructed that there are no places for filth to accumulate where it cannot be cleaned out. Water-tight floors with as few cracks and corners as possible, together with adequate drainage, are important in a piggery.

Disinfection.—Every swine breeder or feeder should acquire the habit of using disinfectants freely. There are numerous proprietary or patent disinfectants on the market, and, so far as the writer is aware, the well-known ones are quite effective if used according to directions accompanying them. Crude carbolic acid and creolin are excellent disinfectants. A five per cent. solution of either, or five parts of the disinfectant to one hundred parts of water, will be found effective for disinfecting pens. Chloride of lime is also good, and is especially recommended by some for pens where cholera has existed. Five or six ounces of chloride of lime to a gallon of water makes an effective disinfectant.

In case of disease, all bedding and manure should be removed and burned. Loose boards or planks should also be removed, and all adhering filth scraped off the floors, partitions and troughs. It is of little use applying a disinfectant on top of a coating of filth which may conceal and protect millions of disease germs. A good spray pump is best for applying the disinfectant, so as to force the liquid into every crack and cranny, and it is not wise to be economical in the use of the disinfectant. Every part of the pen should be thoroughly saturated with the solution.

If there are small outside yards attached to the piggery, they should be floored with concrete, and then they can be disinfected in the same way as the interior of the building. If they are not floored it is almost impossible to disinfect them thoroughly, and they are a constant menace to the health of the animals.

Small lots and large paddocks or feed lots are more difficult to deal with. Littering and plowing up is about all that can be done. In case of some diseases such as cholera, it is safer to remove the hogs to other feed lots or pastures for at least several months. Of course, the lots could be disinfected by saturating the surface soil with a good disinfectant, but it would be an expensive operation.

Systematic disinfection of the premises should not be neglected even if there is no disease. A small spray pump and a constant supply of disinfectant to be used at frequent intervals about the buildings constitute an important part of the equipment of a piggery. At least once a year, a general house-cleaning is advisable, and washing the walls, ceiling, and partitions with lime and crude carbolic acid goes a long way towards keeping the building sanitary. A good pint of crude carbolic acid to three gallons of whitewash will answer the purpose.

Quarantine.—Provision should be made in large herds for quarters where hogs that have been purchased, or brought home from shows, can be kept entirely

separate from the rest of the herd for at least three weeks. The plan of using portable pens and dividing the herd up into small groups has a marked advantage over keeping the hogs in a large piggery, in case a contagious disease breaks out. With the portable pens, all hogs are not exposed, and it is a simpler matter to effect a quarantine.

Hog cholera is the most dangerous contagious disease that the swine breeder has to contend with. In case of an outbreak of either cholera or swine plague in the neighborhood, a most rigid quarantine should be put into force. There should be no visiting back and forth by either man or beast between infected farms and those which are clear, because the virus which causes the disease may be easily carried on the boots of the persons or the feet of animals. Even dogs have been known to carry the disease from one farm to another. Dogs should be tied up until an outbreak of this disease is under control. Carcasses of hogs which die should be burned or buried so deeply that they are not likely to be dug up by dogs or other animals, and disinfection should be systematic and thorough.

Feeding for Health.—Feeding has been dealt with in another place, but the importance of feeding in such a way as to maintain vigor cannot be too deeply impressed. Hogs which are fed in an injudicious manner have their vitality weakened and are more likely to contract disease than those which have been furnished a suitable ration.

Light.—Sunlight is a good disinfectant, and an effort should be made to admit plenty of direct sunlight into all pens. It must be remembered that disease germs flourish best in the dark.

Ventilation and Dryness.—To the difficulty of securing adequate ventilation in the piggery, may be traced a great many troubles which affect pigs. Rheumatism, bronchitis, pneumonia, and scours, the last mentioned being most common in young pigs, are among the commonest winter troubles of swine, and are generally caused by lack of ventilation and consequent dampness in the building. Unless ventilation is provided and the pens kept reasonably dry, good results cannot be expected.

Lice.—When lice once become well established in a herd, it requires a good deal of painstaking effort to eradicate them. They may be the cause of serious loss, and lousy pigs cannot give as good returns for feed consumed as those which are kept clean. It is also claimed by good authorities that lice weaken the vitality of hogs and render them more susceptible to disease.

Almost any of the better known dips will prove effective if used according to directions. A two per cent. solution of creolin (2 parts creolin to 100 parts water) makes a good dip for lice. Coal oil is very effective, but is apt to blister, and should be applied lightly. Crude petroleum is excellent. It is inexpensive, does not blister, and is more lasting in its effects than some patent preparations.

In applying a dip, care must be taken to wet thoroughly all parts of the animal's body. Lice are commonly found on the inside of the legs, about the ears, or in the folds of the skin on any part of the body, and, unless the application of dip is thoroughly made, many of them will escape. Dipping is one of the most effective methods, and, when large numbers are to be treated, it is necessary to have a special dipping vat through which the hogs are compelled to swim. The dip may be applied also by means of a good spray pump, which forces the dip through the hair, and into all crevices. It may also be applied by means of a broom,

using a dip to hold the dip. By brushing the dip into the hair the job can be done thoroughly.

When lice have been in a building for some time, it will be necessary to treat the building in practically the same way as recommended for disinfection, the disinfectants being also good insecticides.

In treating for lice, one application of insecticide is seldom sufficient, because there will be many eggs to hatch out to give a new brood. A second treatment, about a week after the first, should always be given, and a third treatment would not be out of place.

PART VIII.

COMMON DISEASES OF SWINE

HOG CHOLERA, (Swine Fever).

This highly infectious disease is due to a germ, and causes a loss of many millions of dollars annually in the United States. In Canada it is not so prevalent, thanks, mainly, to the very vigorous measures adopted for its eradication. In spite, however, of all efforts, it continues to inflict considerable loss upon Canadian swine growers. It causes an inflammation and ulceration of the stomach and intestines, enlargement and inflammation of the lymphatic glands, and various other disturbances. The most characteristic lesions of the disease are inflamed areas on the lining membrane of the intestines and stomach, which eventually change into raised ulcers, circular in outline.

Symptoms.—The hog usually goes off by itself and lies in a cool place. The back is arched, the hind parts appear stiff, causing the hog to stagger and cross the hind legs as it walks. There is a watery secretion from the eyelids, which later becomes thicker in character, causing the lids to adhere. Owing to increased secretions from the skin, dirt adheres to it, giving the animal a dirty appearance. Alternate diarrhoea and constipation is common, and the diarrhoeal discharge is thin and watery, and some times mixed with blood.

All cases usually terminate in death in from two days to two weeks, but sometimes death occurs before the symptoms become well marked.

In the subacute or mild form, the symptoms may escape notice, but there is usually a slight fever, with loss of appetite, constipation, and diarrhoea. The pig generally recovers in a few days.

The disease is said to be chronic when it lasts for a considerable time, possibly several weeks or even two or three months. Often the pig becomes a complete wreck, and death at last occurs.

Treatment.—When a hog once contracts the disease, little can be done in the way of treatment. Preventive measures are the only effective means for dealing with this disease. In Canada, treatment for hog cholera is not allowed, it being compulsory to slaughter affected herds. Full particulars regarding this law may be obtained by writing the Veterinary Director-General, Department of Agriculture, Ottawa, Ontario.

SWINE PLAGUE.

Swine plague is sometimes mistaken for hog cholera, and often accompanies the latter disease. It is an infectious disease caused by a germ, and the symptoms

are similar to those of cholera. As a rule, the lungs and pleural membrane are inflamed, but the button-like ulcers on the lining membrane of the intestines and stomach, which are characteristic of cholera, are absent. The lining membrane of the stomach and intestines is commonly inflamed, and sometimes ulcers are present, but the ulcers differ from those of cholera, being more hollowed out and less button-like in appearance.

The germs which cause swine plague are more easily destroyed and are less readily carried from one farm to another than those of cholera. Up to the present medicinal treatment has not been successful, and the farmer must rely upon preventive measures. (See under Sanitation.) This disease comes under the same law as cholera.

BRONCHITIS.

Bronchitis commonly attacks young, growing pigs, and may be caused by dust, lung-worms, or damp, chilly quarters. A distressing cough, especially when disturbed from their bed, is one of the most prominent symptoms. Many of the pigs become unthrifty, and, if the disease attacks very young pigs, it is likely to cause death.

Dry, comfortable quarters and nourishing feed will often pull the pigs through, and care should be taken in making the pens and yards sanitary before any more young pigs are put in them.

PNEUMONIA.

Pneumonia is more serious than bronchitis and frequently causes death in a very short time. It often results from a severe cold, and may also be brought on by over-exertion, such as being chased, or driven at too rapid a rate. Damp and unsanitary conditions in the pen may also be a cause. A cough, fever, and hurried or labored respiration are among the symptoms.

About all the farmer can do is to aim to prevent the disease. If he has a case to deal with, careful nursing is the main thing. Comfortable, well-ventilated quarters, and a light, sloppy diet, are important. Daily doses of castor oil will help keep the bowels active, and if the weather is cold the animal should be kept covered with a blanket. Treatment is not very satisfactory, as it is difficult to nurse a very sick pig.

TUBERCULOSIS.

The following extracts are quoted from a report issued by the United States Bureau of Animal Industry:

"Reports gathered from the various meat-packing centres of the United States show tuberculosis of hogs to be on the increase, and causing heavier loss to the raiser and packer alike than any other disease."

"Statistics show that when there were over 56,000,000 hogs in this country their value at that time was over \$339,000,000. Federal inspection at the abattoirs of the country show two per cent. of the hogs slaughtered to be affected with tuberculosis. Reports from Europe show a far more widespread infection, the runs from 5.5 to 7.5 per cent."

"Hogs from Arkansas, Oklahoma, and Texas are remarkably free from tuberculosis, due to the methods of caring for them, or rather the lack of care. They are not restricted to feed-lots, where disease is commonly found, but roam over

to shift for themselves. No prolonged feeding is practised in narrow pens. From birth to maturity they are pastured on alfalfa, oats, corn, rape, and clover. In striking contrast are the hogs slaughtered at three cities in leading dairy states, where there are a large number of co-operative creameries and the raw skim-milk is fed."

"Hogs for packing-houses are learning from bitter experience to avoid certain states, and two firms will not buy hogs from one state known to be infected. In fact, many of the smaller packers in the Central West buy post-mortem inspection, as a measure of self-protection."

"It is known beyond all doubt that the majority of tuberculous hogs are affected by the following causes:

- "1. Feeding raw milk and slime from creameries."
- "2. Feeding hand-separated milk from tuberculous cows."
- "3. Feeding behind tuberculous cattle."
- "4. Feeding tuberculous carcasses."
- "5. Feeding slaughter-house offal."

"The danger of feeding hogs behind tuberculous cattle lies in the fact that such cattle discharge enormous numbers of tuberculosis germs in their faeces."

Symptoms Obscure.—The quotations given show the importance of the disease, and the need for the farmer to be on his guard. It is a contagious disease and must be treated as such. The symptoms are not well marked, and a hog may be badly diseased and show practically no clinical symptoms. If the lungs are affected, the hog usually has a cough, and, if the digestive organs are badly affected, there is generally indigestion, and general lack of thrift; but in later symptoms may show themselves with other diseases, and it requires a great deal of experience to diagnose the disease with certainty.

Treatment.—Entirely preventive. Since the disease is usually communicated to hogs through their feed, it is necessary to make certain that their feed contains no germs. In dairy districts, the practice of sterilizing skim-milk, butter-milk and whey is to be commended, because dairy by-products constitute the main medium for transmitting the disease to hogs. Sanitary surroundings, pure feed, and fresh air are the feeder's main safeguards in connection with this dangerous disease.

INDIGESTION.

Indigestion in various forms is caused by mistakes in feeding. Over-feeding and lack of exercise will sometimes bring on the trouble, or the feeding of swill and injurious substances, such as washing powders, is apt to cause derangement. In the acute form it causes the animal a good deal of pain, causing him to arch his back and give general evidences of suffering. In such cases it is well for the veterinarian prescribe for the trouble. The chronic form sometimes follows an attack of acute indigestion, causing a stunted condition of the animal. Perhaps the best home remedy is castor oil, followed by careful feeding upon easily digested feeds. If not relieved, a veterinarian should be consulted.

CONSTIPATION.

As mentioned in another place, constipation is most disastrous in the case of sows, and is the result of too little exercise and too much concentrated

feed. In cases of constipation, perhaps the simplest remedy is to give them two to four ounces of raw linseed oil once daily in the slop of a mature animal. If this is not effective, give four ounces of Epsom salts. Give exercise and laxative feeds, such as bran, oil meal, or ground flax-seed, roots or alfalfa.

SCOURS

Dr. Alexander (Wisconsin Bulletin 181) writes as follows: "When nursing pigs begin to scour, it is evident that the milk of the sow is disagreed with them, and immediate attention, therefore, should be directed towards improving her ration. Most often the trouble comes from overfeeding or from other rich feed, just after farrowing, and pigs of fat, flabby, pampered, nervous, constipated sows are most apt to suffer. Sudden changes of feed, or feed sour or decomposing slop, or feed from dirty troughs or sour swill-barrels, all tend to cause diarrhoea either in nursing pigs or those that have been weaned, and all such causes should be prevented or removed.

"To correct scouring in nursing pigs, give the sow 15 to 20 grains sulphate of iron (copperas) in her slop night and morning, and if necessary, slightly increase the dose until effective. Lime water may, with advantage, be freely mixed with the slop as a preventive when there is a tendency to derangement, or after the trouble has been checked, and it is also an excellent corrective for weaned pigs showing a tendency to scour on slop or skim-milk. Where little pigs are scouring severely, each may with advantage be given a raw egg and 5 to 10 grains of nitrate of bismuth twice daily, in addition to changing the feed of the sow and mixing copperas in her slop. In cases which do not promptly respond to treatment, success may follow the administration of a dose of castor oil shaken up with the milk. In all cases it is important to set right all errors in diet and sanitation, and to provide the pigs with dry, sunny, well-ventilated quarters. The derangement is always most apt to occur, and sure to prove disastrous, among pigs kept in unsanitary conditions."

INFECTIOUS SORE MOUTH.

This disease is quite common in small pigs from a few days to several weeks old. It is caused by a germ. Filthy quarters and damp, muddy yards favor development of the disease.

One of the first symptoms is a disinclination to suck on the part of nursing pigs, or a falling off in appetite in older pigs. The lining membrane of the mouth becomes inflamed, and sometimes the snout and lips become swollen. Ulcers form, often involving the lips and snout.

Dr. Craig recommends the following treatment:

"As soon as the disease breaks out in a litter, both the mother and pigs should be removed from the herd. The affected pigs can be treated by dipping their head most into a four per cent. water solution of some reliable disinfectant; or potassium permanganate of potassium, one ounce to a gallon of water, can be used. A thorough way to treat them is to wash out the mouth by injecting the solution directly into it with a syringe. It is advisable to use this method whenever practicable, and especially in advanced cases. It is also advisable to clean the ulcerated parts by scraping away the dead tissue and rubbing the surface of the ulcer with lunar caustic. The above treatment should be repeated twice a day in advanced cases, and in mild ones once a day. It should be kept up for as long a time as necessary. It is usually more economical to kill the badly diseased pigs than

as they are apt to scatter the disease and become badly stunted and emaciated. If treatment is adopted from the first appearance of trouble, the disease is not difficult to cure.

THUMPS.

This disease is caused by a disordered digestion which irritates the nerves of the diaphragm, causing sudden contractions of the diaphragm at intervals. The contractions or spasms of the diaphragm cause a jerking of the flank, which is a characteristic symptom of the disease. The pig becomes thin and stunted, and very young pigs are likely to succumb or to become practically worthless. A liberal supply of feed and too little exercise will often bring on the disease. Young pigs often contract the disease before they are weaned if they remain with their mother and are not given much exercise, and it is usually the finest pig in the litter which is the first to go wrong.

Treatment is mainly preventive, and hence the necessity for providing exercise for young pigs, especially if their mother is a liberal milker and the pigs become fat. Judicious feeding and exercise will entirely prevent the disease. If it occurs, it is a signal that a change in methods should be made at once. Sometimes it is difficult to obtain exercise for young pigs in cold weather, and some recommend shutting them in a pen away from the mother for an hour or so twice a day. As a rule, this plan will stimulate the laziest of them to take considerable exercise.

INFLAMMATION OF THE UDDER.

Hog milkers are most liable to have this trouble. Whatever the cause, the disease calls for prompt treatment. Dr. R. A. Craig, in his excellent book, "Diseases of Swine," recommends the following treatment:

"Milking the sow's udder two or three times a day will usually relieve its congested condition. A physic of Epsom salts should be given every other day, and a light diet fed.

If the udder becomes inflamed, it should be kneaded gently with the fingers, and the following ointment applied daily: Extract of belladonna and gum arabic (one drachm of each), and vaseline, (three ounces). Hot fomentations should be used.

The teats should be bathed daily with white lotion (one part zinc sulphate, and three parts of a part lead acetate, and thirty parts water) until healed."

ECZEMA.

It and similar skin troubles can usually be successfully treated by washing with a one per cent. solution of creolin, or some of the well-known disinfectants. The hog should be kept in a clean, dry place, and out of the sun. It sometimes requires time to effect a cure, and the treatment should be continued every day until the disease is conquered.

RHEUMATISM.

In warm latitudes, rheumatism often occurs among swine, especially during cold weather. Damp, ill-ventilated pens are a common cause, and it may

sometimes be caused by over-feeding. Piggeries built with stone or concrete walls and floors are generally more dangerous than those built of wood. When such walls are hollow and the floors insulated with a tar layer, they are much safer.

The hog becomes very lame and stiff and moves about with difficulty. Sometimes the joints become swollen and very painful, and the animal becomes practically helpless. In such cases it is seldom that the hog makes a recovery.

The feeder must be on his guard against this disease. Dry, well-ventilated pens and careful feeding will generally enable him to avoid disaster. Animals which become affected should be kept in dry, warm quarters. Dr. Craig ("Diseases of Swine") says: "Salicylate of soda is the most useful drug to give in this disease. The dose is twenty or thirty grains in the feed, or as a drench, three times a day. Larger doses, and at more frequent intervals, may be given in acute cases for a short time. Quinine and bitter tonics can also be given. Blistering ointments and liniments should be applied to the inflamed articulations."

RICKETS.

In this disease, which is commonly found among young pigs, there is enlargement, bending, and distortion of the bones of the joints and limbs, and fractures of leg bones are not uncommon. The bones do not contain their normal proportion of mineral matter, and hence lack strength. It is claimed that the disease is most common among closely in-bred hogs. The excessive feeding of corn throughout generations of swine is believed to be an exciting cause, or any conditions which interfere with proper nutrition, such as disease or unsanitary surroundings, may predispose towards the disease in question.

Dr. Alexander of Wisconsin says: "Pigs affected with rickets can seldom be profitably treated. Prevention is to be sought by avoiding the causes mentioned, maintaining sanitary conditions about the hogs, providing adequate supplies of various feeds, rich in all the requisites of a perfectly nourished animal, and obviating degeneracy by careful selection of robust sows and timely infusion of new blood."

Plenty of mineral matter should be provided at all times during the life of the pig. Methods and forms of supplying mineral matter have already been given in this bulletin.

PARALYSIS.

In Virginia Bulletin 189, Dr. Mayo writes: "The disease first appears as a slight loss of control of the hind legs, as shown by a weaving of the body, kicking of the fetlocks, and finally a paralysis more or less complete. The animal is unable to raise itself on its hind legs, and often drags the hind quarters as it moves about. The disease occurs in swine of all ages. This disease is popularly supposed to be caused by 'kidney worm,' but there is no evidence to support this belief. The disease seems to be located in the spinal cord at the lumbar region, but the actual cause is unknown at present."

Some cases recover without treatment, but a majority of the cases prove fatal. Generally the treatment is to give a purgative of from one-half to two ounces of castor oil, depending upon the size of the animal, followed by nourishing, easily digested feed. Rubbing the back vigorously with a good veterinary liniment once daily is also beneficial."

MANGE.

Mange is caused by very small animal parasites called mange mites, which burrow in the outer layer of the skin.

This disease is most troublesome in young pigs, causing great irritation. The little pigs scratch and rub themselves. Later, the hair falls out, and thick scabs form at the roots of the hair on the neck and shoulder about the ears and face. The scabs extend along the back to the root of the tail.

Dr. Mayo, of the Virginia Experiment Station, strongly recommends the lime sulphur dip, which is made as follows: Take 8 pounds of fresh lime and enough water to form a thick paste. Sift into this paste 24 pounds of sulphur and mix thoroughly with a hoe. Place in a kettle with 25 or 30 gallons of water and boil for at least one hour, then add enough water to make 100 gallons of dip. The dip should be used warm, about 100 or 110 degrees Fahrenheit.

Coal-tar dips, such as chloro naphtholeum, zenoleum, and others of this class, give good results, and are more convenient when a small number of animals are to be treated.

It is very important that the animals be kept wet with the solution until all the scabs are thoroughly soaked through, and it is a good plan to scrub off with a stiff brush to remove as much as possible of the scabs. Two thorough treatments, ten days apart, are necessary.

Pens should be thoroughly cleaned and disinfected. Sows should be treated as well as the young pigs, though the disease may not show to any great extent in the sows. The disease is transmitted by contact, and the young pigs almost always become infected through coming in contact with a diseased mother.

INTESTINAL WORMS.

Common Round Worm.—The most common intestinal worm affecting swine is the round worm, which is found mainly in the small intestine. If a post-mortem examination is made some time after death, the worms may be found in the stomach, having made their way there after the death of the animal. The worms vary from six to seven inches in length, and taper somewhat towards the extremities. In color they are usually a yellowish white. The eggs of the female pass out with the excrement and become scattered over the premises. Eventually, the young worms are taken up by other hogs along with their food.

They do not seem to cause the hog any inconvenience unless they are present in large numbers, when they may cause digestive troubles, and the writer has known them to result. There can be little doubt, however, that a pig affected with them cannot make the best use of its feed, even though it may appear quite healthy.

Thorn-headed Worm.—This parasite is much less common than the round worm. It is usually found attached to the wall of the intestines by its proboscis, from which it derives the name "thorn-headed." In length it is about equal to the round worm, but its surface is somewhat wrinkled, and the extremity is blunt. Though only a few are usually found in an animal, they do much more damage than the round worm, irritating the lining of the intestine and sometimes causing severe inflammation. It would be difficult to distinguish the symptoms from other intestinal derangements, but a post-mortem examination would readily reveal the presence of the worm.

Pin Worm.—The pin-worm is very small and might be easily overlooked as post-mortem. It is usually found near the beginning of the large intestine.

intestine, often hidden in the folds of the lining membrane. It is a very common parasite of swine, and does not seem to cause much inconvenience to the animal.

Whip-Worm.—This is also a small worm, being about one and one-half inches long. It attaches its head to the lining of the intestine, and is usually found in the beginning of the large intestine. The anterior portion is very thin and hairlike, and the posterior portion is thick and cylindrical in shape. Like the pin-worm, it does not seem to create much disturbance, but must be more or less injurious.

Treatment for Intestinal Worms.—Preventive treatment consists in keeping buildings and surroundings clean and sanitary. Feeding in filthy yards and allowing to drink stagnant water are practices which favor the spread of parasites.

As to medicinal treatment, the writer has found that allowing hogs to have access to a mixture of charcoal and salt, or charcoal, wood ashes, and salt, seems to be quite effective in driving out round worms.

Turpentine is commonly recommended for worms, especially the thorn-headed worm. The dose is a teaspoonful for every eighty or one-hundred pounds live weight of the hogs to be treated. It can be given in the feed, and the hogs should be fasted at least twelve hours before treatment. A dose each day for three days will generally prove effective.

Another remedy which is recommended is five grains of calomel and eight grains of santonin for every hundred pounds live weight of the hogs. This remedy can also be given in the feed. It is generally advisable to give a physic after treatment for worms.

LUNG WORMS.

The lung worm is a small, thread-like, whitish worm, sometimes found in large numbers in the air passages of the lungs. Ordinarily, about the only symptom is a spasmodic cough, which is somewhat similar to the cough which accompanies bronchitis. Sometimes the irritation caused by the worms produces inflammation and consolidation of the lung tissue, in which case the animal dies but in many cases no bad effect is apparent. In a post-mortem examination, the worms can be detected by cutting the lung near the apex and then squeezing the tissue next to the cut. The pressure forces the thread-like worms out upon the cut surface.

There is practically no effective treatment for this parasite. Clean pens, in which disinfectants are liberally used, and clean, well-drained yards, will help keep the worm in check. Filthy yards and wallows favor its development. Ploughing up old hog lots and re-seeding them is also a preventive measure.

OTHER DISEASES.

The diseases which have been mentioned represent only a few of the troubles which may affect the hog, and no attempt has been made to treat the subject from a veterinarian's standpoint. There are other diseases. The aim has been to note only a few simple remedies for common ailments, rather than the cure of diseases. The hog is not easy to treat for disease, and the main effort of the farmer should be towards maintaining health and preventing the entrance of disease into his herd. In regard to the long list of diseases which have not been mentioned together with many of those included in the list, it will generally be advisable

consult a skilled veterinarian, but the services of a veterinarian can often be rendered unnecessary if the farmer makes the best use of the means at his disposal.

Examine Carcasses. —Every man who has to deal with stock should make a practice of holding a post-mortem upon every animal that dies upon the farm. He will soon learn what healthy organs should look like, and will be able to locate the seat of the trouble. If he cannot determine the nature of the disease, he can take the diseased organ or organs to a veterinarian, or send them immediately to the nearest experiment station, and have the disease identified. Experiment stations exist for the purpose of helping the farmer, and the officers of the stations will be glad to send any information they can to help him overcome his difficulties.

ADMINISTRATION OF MEDICINE.

Medicines which are not distasteful can be given with the feed, provided the hog has not completely lost its appetite. Wherever possible the administration of medicine in the feed is preferable to drenching.

Dr. Craig ("Diseases of Swine") recommends the following method of drenching hogs:

"To hold the animal while drenching it, a noose of sash-cord or quarter-inch rope can be placed around the upper jaw well back toward the angles of the lips, and the medicine thrown into the back part of the mouth with a dose syringe. As there is a danger of the hog breaking the syringe, it is best to use a metal one. Sometimes, when the drench is bulky and the hog hard to hold, it is necessary to elevate the head and raise the fore-feet off the ground. For this purpose a pulley and rope wire stretcher is recommended. It is best to wait until the hog has become quiet and well under control before giving it the drench, as there is some danger of the medicine getting into the air-passages and doing harm."

The writer has seen more than one hog killed in the operation of drenching. If the drench is poured too rapidly into the throat, it is almost sure to be drawn into the lungs, and the hog will probably die in a few minutes. The medicine should be poured very slowly, and it is best to pour it just inside the cheek instead of into the throat.

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